PowerFlex® 700S Adjustable Frequency AC Drive - Phase II (Frames 1 - 6)

Introduction

This document is designed to guide you through the basic steps needed to install, start-up, and program the PowerFlex 700S Adjustable Frequency AC - Phase II drive for Frames 1 - 6. **The information provided in this document does not replace the user manual and is intended for qualified personnel only.** For detailed PowerFlex 700S information refer to the appropriate publications listed below.

Reference Materials

Allen-Bradley publications are available on the internet at: www.rockwellautomation.com/literature.

Title	Publication
PowerFlex 700S Drives with Phase II Control User Manual	20D-UM006
PowerFlex 700S Drives with Phase II Control Reference Manual	PFLEX-RM003
PowerFlex 700S and DriveLogix™ Firmware Release Notes	20D-RN007
PowerFlex 700H/S High Power Installation Instructions (Frames 9 - 12)	PFLEX-IN006
Wiring and Grounding Guidelines for Pulse Width Modulated (PWM) AC Drives	DRIVES-IN001

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Step 1 Read General Information

General Precautions **Class 1 LED Product**

ATTENTION: Hazard of permanent eye damage exists when using optical transmission equipment. This product emits intense light and invisible radiation. Do not look into module ports or fiber optic cable connectors.

ATTENTION: This drive contains **ESD** (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures, reference Allen-Bradley publication 8000-4.5.2, “Guarding Against Electrostatic Damage” or any other applicable ESD protection handbook.

ATTENTION: An incorrectly applied or installed drive can result in component damage or a reduction in product life. Wiring or application errors such as under sizing the motor, incorrect or inadequate AC supply, or excessive surrounding air temperatures may result in malfunction of the system.

ATTENTION: Only **qualified personnel** familiar with the PowerFlex 700S Drive and associated machinery should plan or implement the installation, start-up and subsequent maintenance of the system. Failure to comply may result in personal injury and/or equipment damage.

ATTENTION: To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged before performing any work on the drive. Measure the DC bus voltage at the +DC & –DC terminals of the Power Terminal Block (refer to Chapter 1 in the *PowerFlex 700S User Manual*, publication 20D-UM006, for location). The voltage must be zero.

ATTENTION: Risk of injury or equipment damage exists. DPI or SCANport host products must not be directly connected together via 1202 cables. Unpredictable behavior can result if two or more devices are connected in this manner.

ATTENTION: Risk of injury or equipment damage exists. Parameters 365 [Encdr0 Loss Cnfg] - 394 [VoltFdbkLossCnfg] let you determine the action of the drive in response to operating anomalies. Precautions should be taken to ensure that the settings of these parameters do not create hazards of injury or equipment damage

ATTENTION: Risk of injury or equipment damage exists. Parameters 383 [SL CommLoss Data] - 392 [NetLoss DPI Cnfg] let you determine the action of the drive if communications are disrupted. You can set these parameters so the drive continues to run. Precautions should be taken to ensure the settings of these parameters do not create hazards of injury or equipment damage.

EMC Instructions

CE Conformity

Conformity with the Low Voltage (LV) Directive and Electromagnetic Compatibility (EMC) Directive has been demonstrated using harmonized European Norm (EN) standards published in the Official Journal of the European Communities. PowerFlex Drives comply with the EN standards listed below when installed according to the PowerFlex 700S Phase II Control User and Reference Manual.

Declarations of Conformity are available online at:
http://www.rockwellautomation.com/products/certification/

Low Voltage Directive (73/23/EEC)

- EN50178 Electronic equipment for use in power installations.

EMC Directive (89/336/EEC)

- EN61800-3 Adjustable speed electrical power drive systems Part 3: EMC product standard including specific test methods.

Essential Requirements for CE Compliance

Conditions 1-6 listed below **must be** satisfied for PowerFlex drives to meet the requirements of **EN61800-3**.

1. Standard PowerFlex 700S CE compatible Drive.
2. Review important precautions/attentions statements throughout this document before installing drive.
3. Grounding as described in the *PowerFlex 700S Drives with Phase II Control User Manual*, publication 20D-UM006
4. Output power, control (I/O) and signal wiring must be braided, shield cable with a coverage of 75% or better, metal conduit or equivalent attenuation.
5. All shielded cables should terminate with proper shielded connector.
6. Conditions in Table A.

Table A PowerFlex 700S EN61800-3 EMC Compatibility(1)

Frame(s)	Second Environment	First Environment Restricted Distribution	
	Restrict Motor Cable to 30 m (98 ft.)	*Restrict Motor Cable to 150 m (492 ft.)*	
	Any Drive and Option	*Any Drive and Option*	*External Filter Required*
1 - 6	✔	✔	✔

(1) External filters for First Environment installations and increasing motor cable lengths in Second Environment installations are available. Roxburgh models KMFA (RF3 for UL installations) and MIF or Schaffner FN3258 and FN258 models are recommended. Refer to http://www.deltron-emcon.com and http://www.mtecorp.com (USA) or http://www.schaffner.com, respectively.

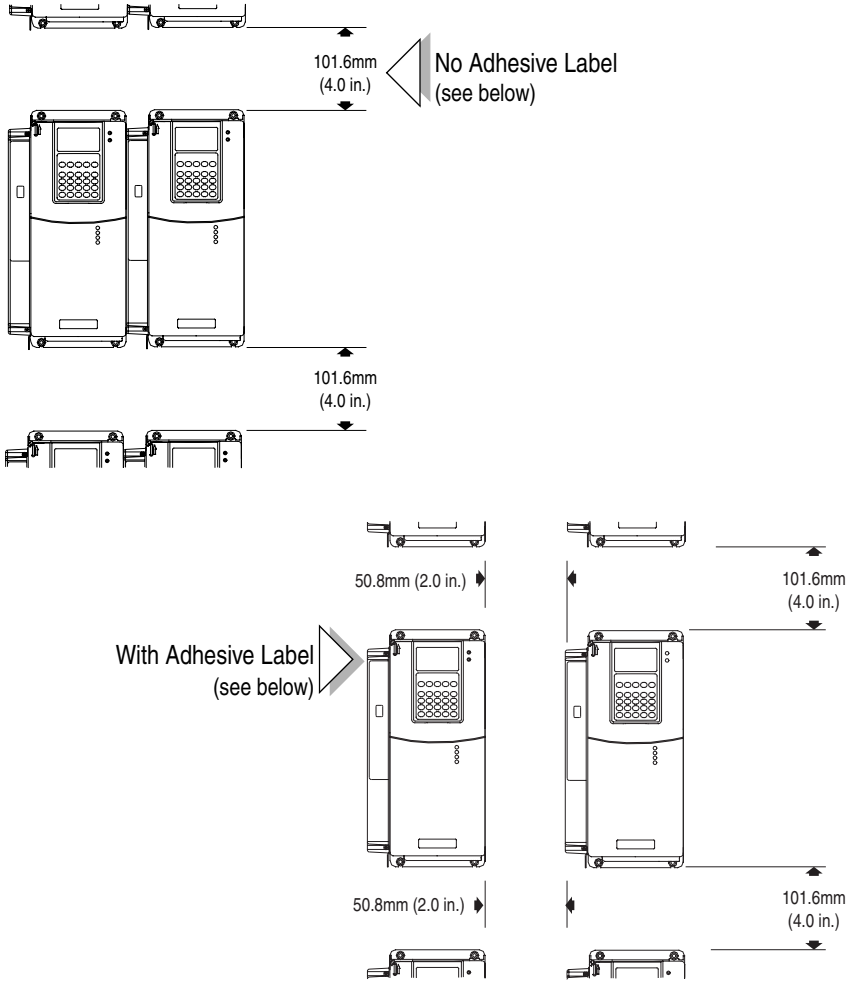
General Notes

- If the adhesive label is removed from the top of the drive, the drive must be installed in an enclosure with side openings less than 12.5 mm (0.5 in.) and top openings less than 1.0 mm (0.04 in.) to maintain compliance with the LV Directive.
- The motor cable should be kept as short as possible in order to avoid electromagnetic emission as well as capacitive currents.
- Use of line filters in ungrounded systems is not recommended.
- PowerFlex drives may cause radio frequency interference if used in a residential or domestic environment. The installer is required to take measures to prevent interference, in addition to the essential requirements for CE compliance provided in this section, if necessary.
- Conformity of the drive with CE EMC requirements does not guarantee an entire machine or installation complies with CE EMC requirements. Many factors can influence total machine/installation compliance.
- PowerFlex drives can generate conducted low frequency disturbances (harmonic emissions) on the AC supply system.
- More information regarding harmonic emissions can be found in the *PowerFlex 700S Phase II Control - Reference Manual*, publication PFLEX-RM003.
- When operated on a public supply system, it is the responsibility of the installer or user to ensure, by consultation with the distribution network operator and Rockwell Automation, if necessary, that applicable requirements have been met.

Step 2 Mount the Drive

Minimum Mounting Clearances

Figure 1 Minimum Mounting Clearance Requirements



Operating Temperatures

PowerFlex 700S drives are designed to operate in a surrounding air temperature range of 0° to 40° C. To operate the drive in installations with surrounding air temperature between 41° and 50° C, remove the adhesive label affixed to the top of the drive enclosure.

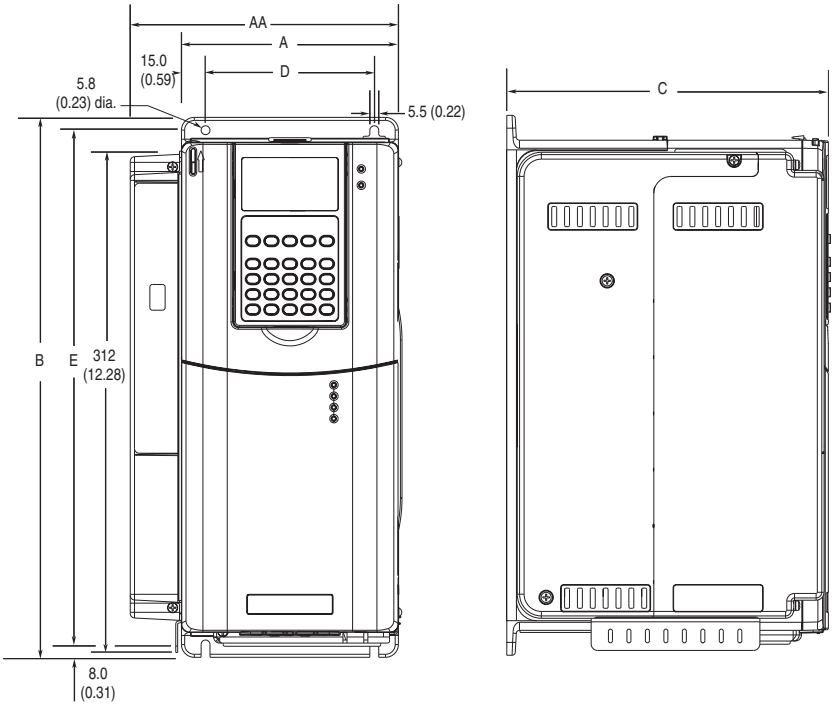
Important: Removing the adhesive label from the drive changes the NEMA enclosure rating from Type 1 to Open type.

Dimensions

Table B PowerFlex 700S Frames

Frame	AC Input												DC Input			
	208		240		380 . . . 400V		480V		600V		690V		540V		650V	
	ND HP	HD HP	ND HP	HD HP	ND kW	HD kW	ND HP	HD HP	ND HP	HD HP	ND HP	HD HP	ND HP	HD HP	ND HP	HD HP
1	0.75	0.37	1.0	0.75	0.75	0.55	1	0.75	1	0.5	–	–	–	–	–	–
	1.5	0.75	2.0	1.5	1.5	0.75	2	1.5	2	1	–	–	–	–	–	–
	2.2	1.5	3.0	2.0	2.2	1.5	3	2	3	2	–	–	–	–	–	–
	4.0	2.2	5.0	3.0	4.0	2.2	5	3	5	3	–	–	–	–	–	–
	5.5	4.0	7.5	5.0	5.5	4.0	7.5	5	7.5	5	–	–	–	–	–	–
	–	–	–	–	7.5	5.5	10	7.5	10	7.5	–	–	–	–	–	–
	–	–	–	–	11	7.5	15	10	15	10	–	–	–	–	–	–
2	7.5	5.5	10	7.5	15	11	20	15	20	15	–	–	–	–	–	–
	–	–			18.5	15	25	20	25	20	–	–	–	–	–	–
3	11	7.5	15	10	22	18.5	30	25	30	25	–	–	–	–	–	–
	15	11	20	15	30	22	40	30	40	30	–	–	–	–	–	–
	–	–	–	–	37	30	50	40	50	40	–	–	–	–	–	–
4	18.5	15	25	20	45	37	60	50	60	50	–	–	–	–	–	–
	22	18.5	30	25	–	–	–	–	–	–			–	–	–	–
5	30	22	40	30	55	45	75	60	75	60	75	55	55	45	75	60
	30	30	50	40	55	45	100	75	100	75	90	75	55	45	75	60
	–	–	–	–	–	–	–	–	–	–	–	–	55	45	100	75
	–	–	–	–	–	–	–	–	–	–	–	–	55	45	100	75
6	45	37	60	50	90	75	125	100	125	100	110	90	90	75	125	100
	55	45	75	60	110	90	150	125	150	125	132	110	90	75	125	100
	66	55	100	75	132	110	200	150	–	–	–	–	110	90	150	125
	–	–	–	–	–	–	–	–	–	–	–	–	110	90	150	125
	–	–	–	–	–	–	–	–	–	–	–	–	132	110	200	150
	–	–	–	–	–	–	–	–	–	–	–	–	132	110	200	150

Figure 2 PowerFlex 700S Frame 1-3 *(Frame 1 Shown)*



Dimensions are in millimeters and (inches)

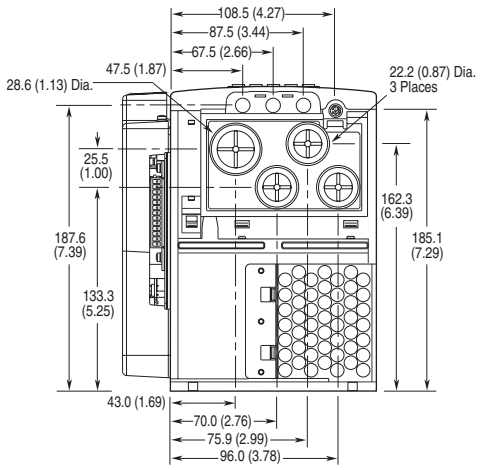
Frame(1)	*Slim* A	*Expanded* AA	B	C	D	E	Weight(2) *kg (lbs.)* Drive	Drive & Packaging
1	135.0 (5.31)	166.9 (6.57)	336.0 (13.23)	200.0 (7.87)	105.0 (4.13)	320.0 (12.60)	7.03 (15.5)	9.98 (22)
2	222.0 (8.74)	253.9 (9.99)	342.5 (13.48)	200.0 (7.87)	192.0 (7.56)	320.0 (12.60)	12.52 (27.6)	15.20 (33.5)
3	222.0 (8.74)	253.9 (9.99)	517.5 (20.37)	200.0 (7.87)	192.0 (7.56)	500.0 (19.69)	18.55 (40.9)	22.68 (50)

(1) Refer to Table B for frame information.

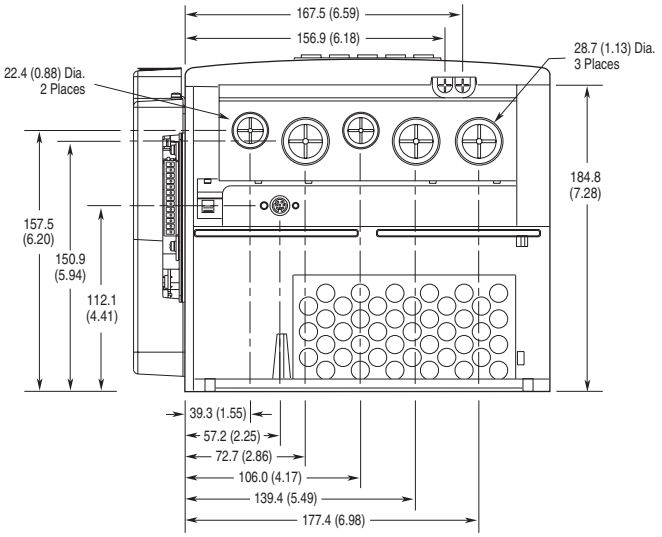
(2) Weights include HIM, DriveLogix controller with ControlNet daughtercard, Hi-Resolution Encoder Option, and 20-COMM-C ControlNet adapter.

Figure 3 PowerFlex 700S Bottom View Dimensions, Frame1-3

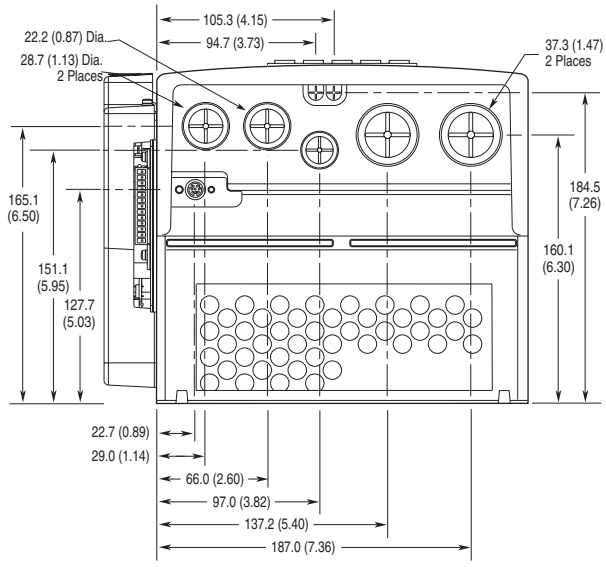
Frame 1



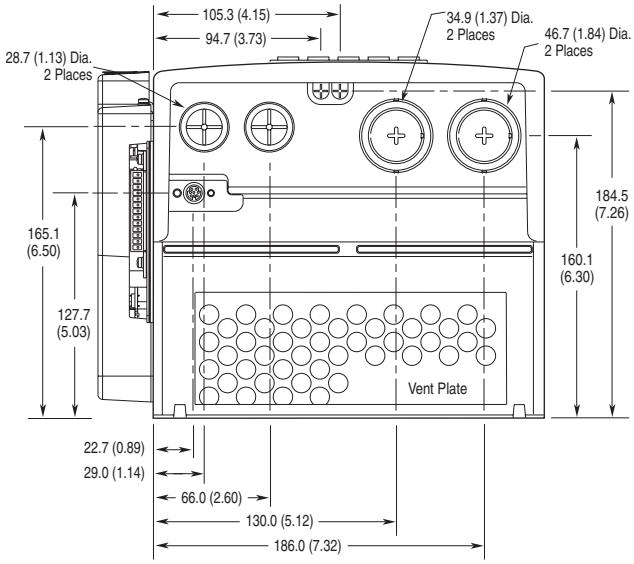
Frame 2



Frame 3 - All Drives, except 50 HP, 480 V (37 kW, 400V)

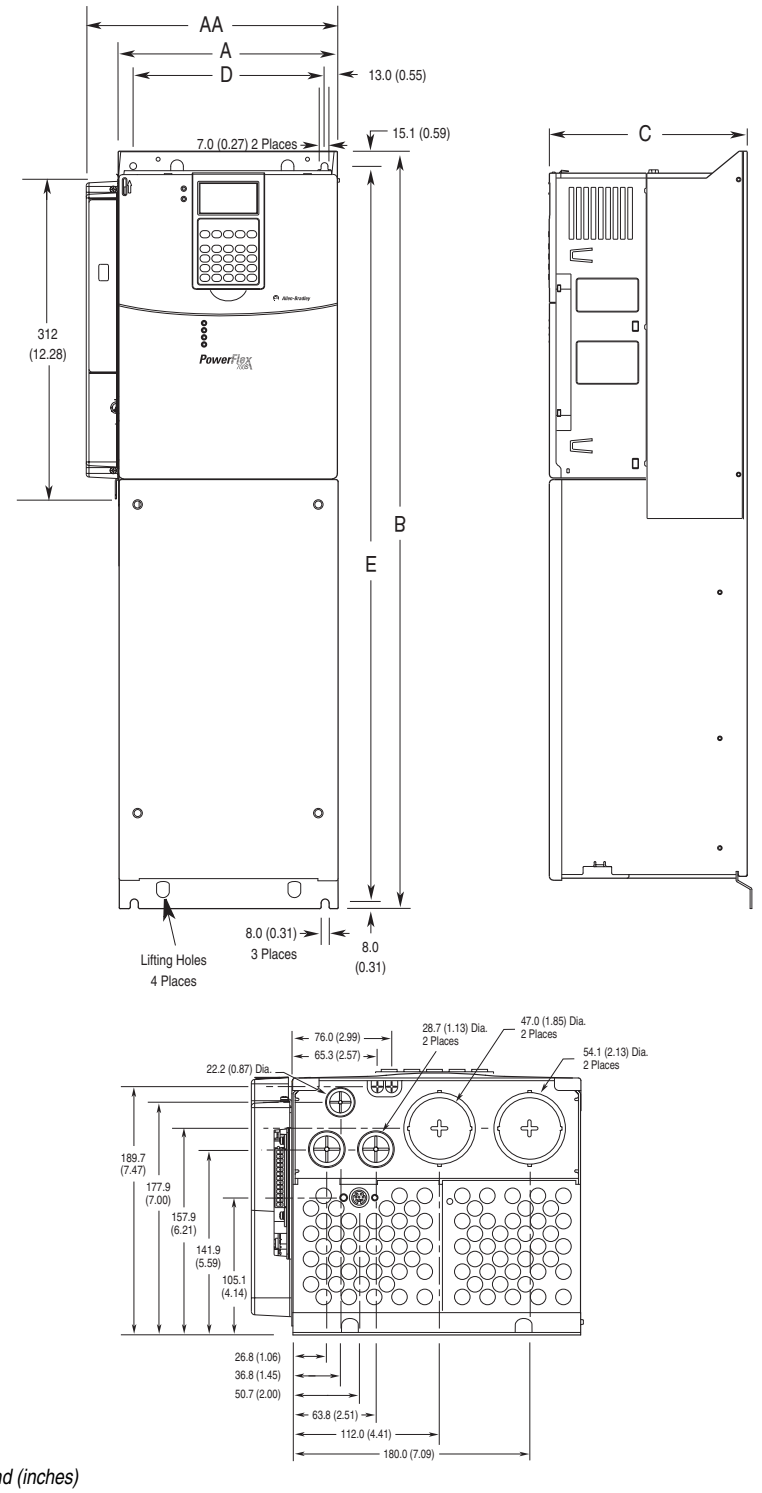


Frame 3 - 50 HP, 480V (37 kW, 400V) Normal Duty



Dimensions are in millimeters and (inches)

Figure 4 PowerFlex 700S Frame 4 Dimensions



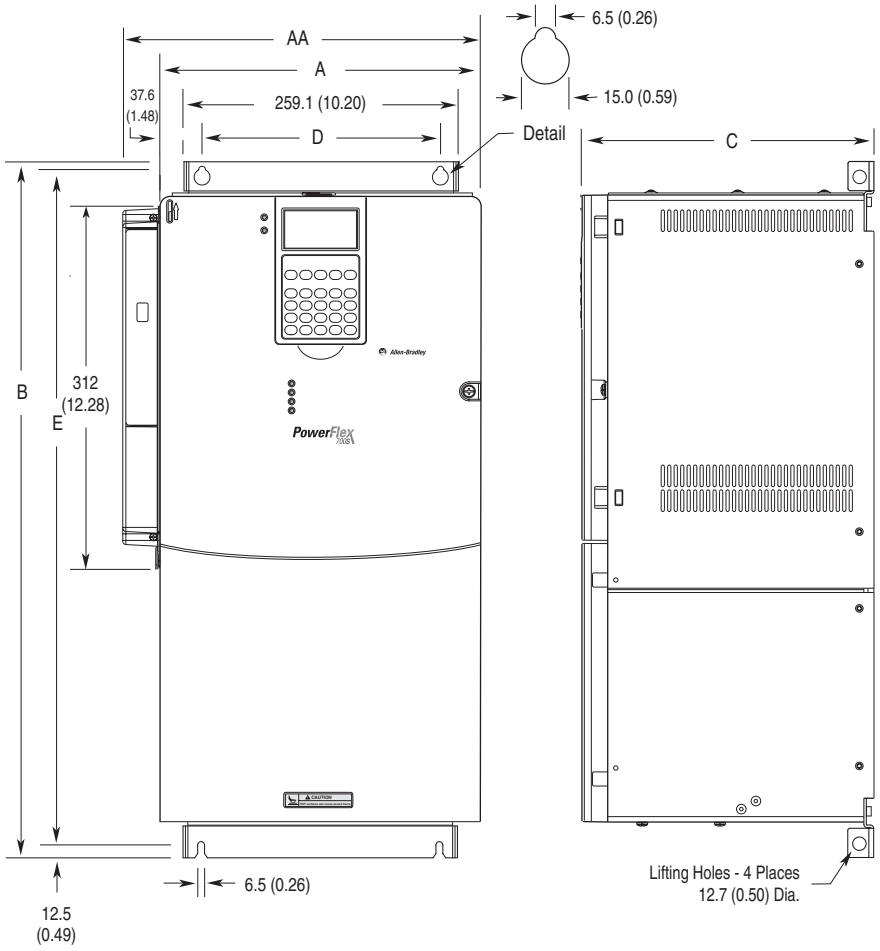
Dimensions are in millimeters and (inches)

Frame[1]	*Slim* **A** *(Max.)*	*Expanded* **AA**	**B**	**C** *(Max.)*	**D**	**E**	**Weight**[2] *kg (lbs.)*	
							Drive	**Drive & Packaging**
4	220.0 (8.66)	251.9 (9.92)	758.8 (29.87)	201.7 (7.94)	192.0 (7.56)	738.2 (29.06)	24.49 (54.0)	29.03 (64.0)

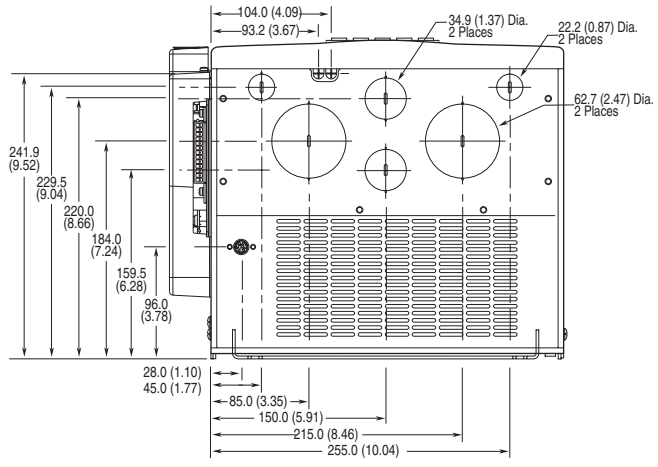
(1) Refer to the Table B table for frame information.

(2) Weights include HIM, DriveLogix controller with ControlNet daughtercard, Hi-Resolution Encoder Option, and 20-COMM-C ControlNet adapter.

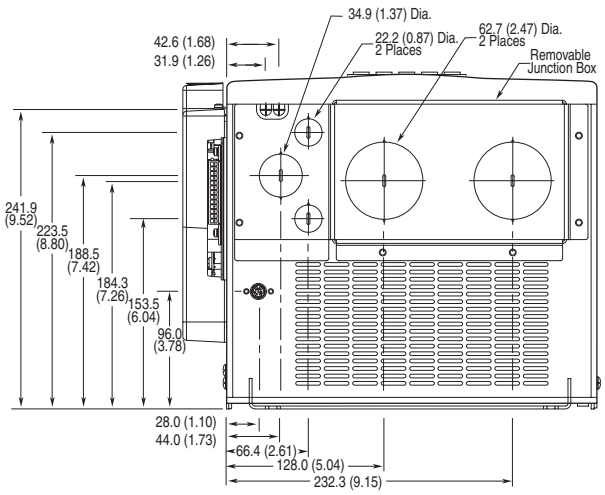
Figure 5 PowerFlex 700S Frame 5 Dimensions



Frame 5 - 75 HP, 480 V (55kW, 400V)



Frame 5 - 100 HP, 480 V (55kW, 400V)



Dimensions are in millimeters and (inches)

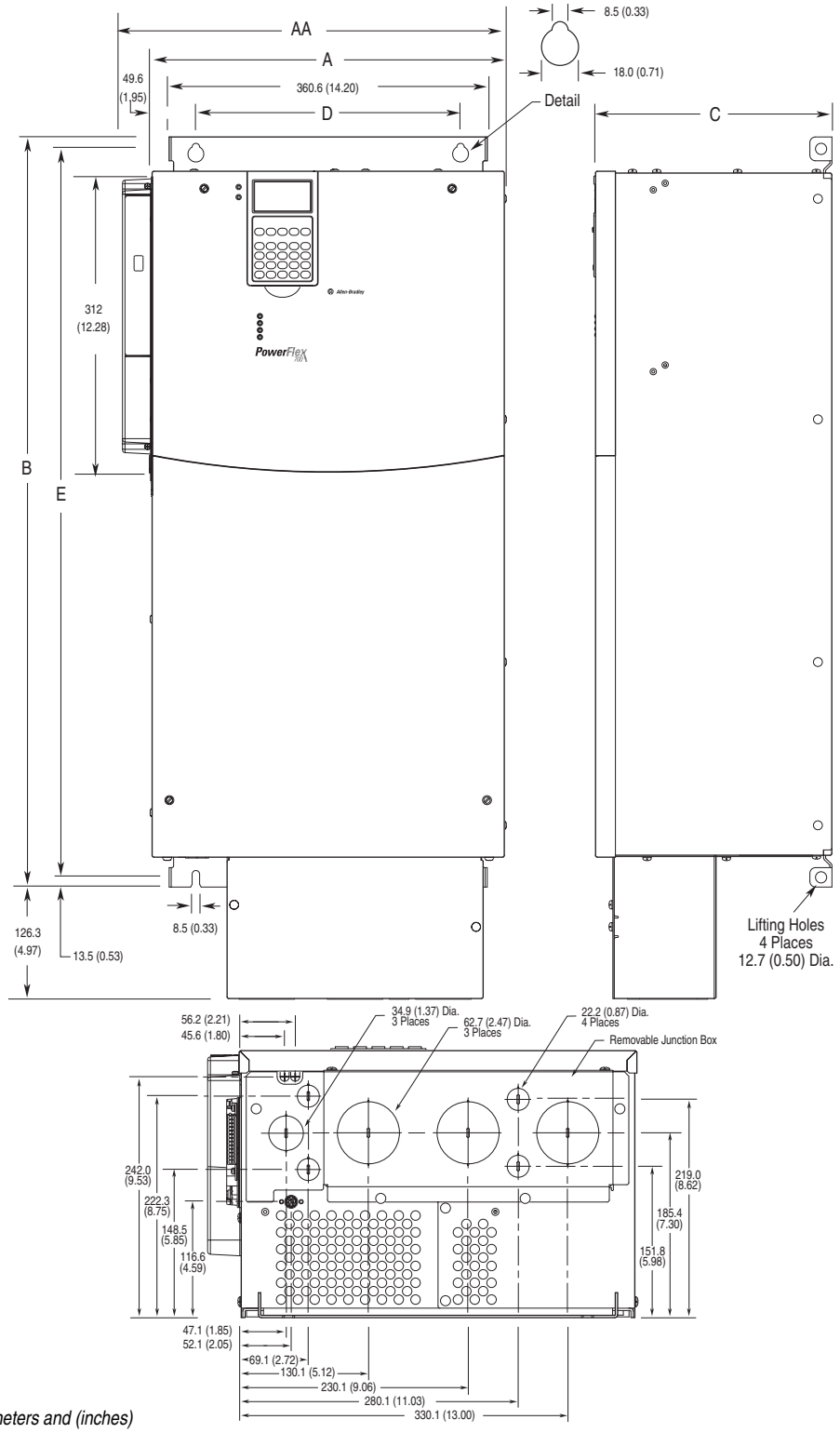
Frame(1)	*Slim* **A** *(Max.)*	*Expanded* **AA**	**B**	**C** *(Max.)*	**D**	**E**	**Weight**(2) *kg (lbs.)*	
							Drive	**Drive & Packaging**
5	308.0 (12.16)	339.9 (13.38)	644.5 (25.37)(3)	275.4 (10.84)	225.0 (8.86)	625.0 (24.61)	37.19 (82.0)	42.18 (93.0)

(1) Refer to the Table B table for frame information.

(2) Weights include HIM, DriveLogix controller with ControlNet daughtercard, Hi-Resolution Encoder Option, and 20-COMM-C ControlNet adapter.

(3) When using the supplied junction box (100 HP drives Only), add an additional 45.1 mm (1.78 in.) to this dimension.

Figure 6 PowerFlex 700S Frame 6 Dimensions



Dimensions are in millimeters and (inches)

Frame[1]	*Slim* **A** *(Max.)*	*Expanded* **AA**	**B**	**C** *(Max.)*	**D**	**E**	**Approx. Weight**[2] *kg (lbs.)* **Drive**	**Drive & Packaging**
6	403.9 (15.90)	435.8 (17.16)	850.0 (33.46)	275.5 (10.85)	300.0 (11.81)	825.0 (32.48)	71.44 (157.5)[3]	91.85 (202.5)

(1) Refer to the Table B table for frame information.

(2) Weights include HIM and Standard I/O.

(3) Add an additional 3.6 kg (8.00 lbs.) for 200 HP drives.

Step 3 Power Wiring

Wire Recommendations

Since most start-up difficulties are the result of incorrect wiring, take every precaution to assure the wiring is correct. Read and understand all items in this section before beginning installation.

ATTENTION: The following information is merely a guide for proper installation. The Allen-Bradley Company cannot assume responsibility for the compliance or the noncompliance to any code, national, local or otherwise for the proper installation of this drive or associated equipment. A hazard of personal injury and/or equipment damage exists if codes are ignored during installation.

Power Cable Types Acceptable for 200-600 Volt Installations

ATTENTION: National Codes and standards (NEC, VDE, BSI etc.) and local codes outline provisions for safely installing electrical equipment. Installation must comply with specifications regarding wire types, conductor sizes, branch circuit protection and disconnect devices. Failure to do so may result in personal injury and/or equipment damage.

General

A variety of cable types are acceptable for drive installations. For many installations, unshielded cable is adequate, provided it can be separated from sensitive circuits. As an approximate guide, allow a spacing of 0.3 meters (1 foot) for every 10 meters (32.8 feet) of length. In all cases, long parallel runs must be avoided. Do not use cable with an insulation thickness less than or equal to 15 mils (0.4mm/0.015 in.). Use tinned copper wire only. Wire gauge requirements and recommendations are based on 75° C. Do not reduce wire gauge when using higher temperature wire.

Unshielded

THHN, THWN or similar wire is acceptable for drive installation in dry environments provided adequate free air space and/or conduit fill rates limits are provided. **Do not use THHN or similarly coated wire in wet areas**. Any wire chosen must have a minimum insulation thickness of 15 Mils and should not have large variations in insulation concentricity.

Shielded/Armored Cable

Shielded cable contains all of the general benefits of multi-conductor cable with the added benefit of a copper braided shield that can contain much of the noise generated by a typical AC Drive. Strong consideration for shielded cable should be given in installations with sensitive equipment such as weigh scales, capacitive proximity switches and other devices that may be affected by electrical noise in the distribution system. Applications with large numbers of drives in a similar location, imposed EMC regulations or a high degree of communications/networking are also good candidates for shielded cable.

Shielded cable may also help reduce shaft voltage and induced bearing currents for some applications. In addition, the increased impedance of shielded cable may help extend the distance the motor can be located from the drive without the addition of motor protective devices such as terminator networks. Refer to Reflected Wave in *Wiring and Grounding Guidelines for PWM AC Drives*, publication DRIVES-IN001.

Consideration should be given to all of the general specifications dictated by the environment of the installation, including temperature, flexibility, moisture characteristics and chemical resistance. In addition, a braided shield should be included and specified by the cable manufacturer as having coverage of at least 75%. An additional foil shield can be greatly improve noise containment.

A good example of recommended cable is Belden® 295xx (xx determines gauge). This cable has 4 XLPE insulated conductors with a 100% coverage foil and an 85% coverage copper braided shield (with drain wire) surrounded by a PVC jacket.

Other types of shielded cable are available, but the selection of these types may limit the allowable cable length. Particularly, some of the newer cables twist 4 conductors of THHN wire and wrap them tightly with a foil shield. This construction can greatly increase the cable charging current required and reduce the overall drive performance. Unless specified in the individual distance tables as tested with the drive, these cables are not recommended and their performance against the lead length limits supplied is not known.

Table C Recommended Shielded Wire for Power Wiring

Location	Rating/Type	Description
Standard (Option 1)	600V, 90° C (194° F) XHHW2/RHW-2 Anixter B209500-B209507, Belden® 29501-29507, or equivalent	Four tinned copper conductors with XLPE insulation. Copper braid/aluminum foil combination shield and tinned copper drain wire. PVC jacket.
Standard (Option 2)	Tray rated 600V, 90° C (194° F) RHH/RHW-2 Anixter OLF-7xxxxx or equivalent	Three tinned copper conductors with XLPE insulation. 5 mil single helical copper tape (25% overlap min.) with three bare copper grounds in contact with shield. PVC jacket.
Class I & II; Division I & II	Tray rated 600V, 90° C (194° F) RHH/RHW-2 Anixter 7V-7xxxx-3G or equivalent	Three bare copper conductors with XLPE insulation and impervious corrugated continuously welded aluminum armor. Black sunlight resistant PVC jacket overall. Three copper grounds on #10 AWG and smaller.

Figure 7 Power Terminal Block Location

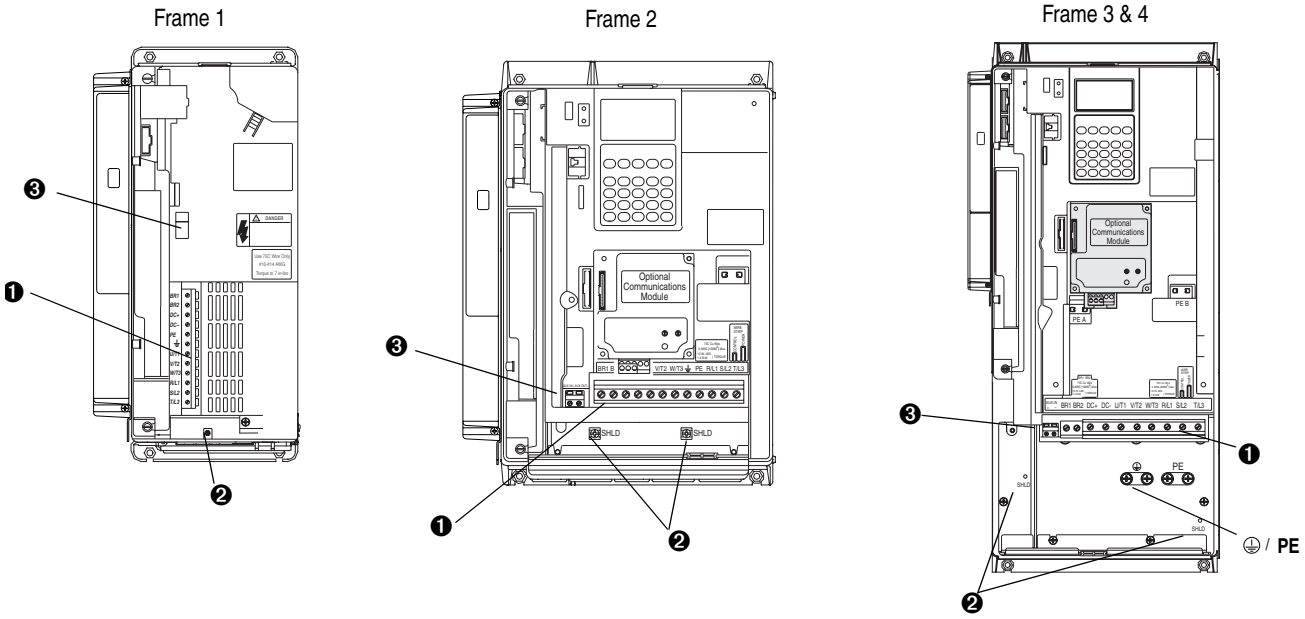
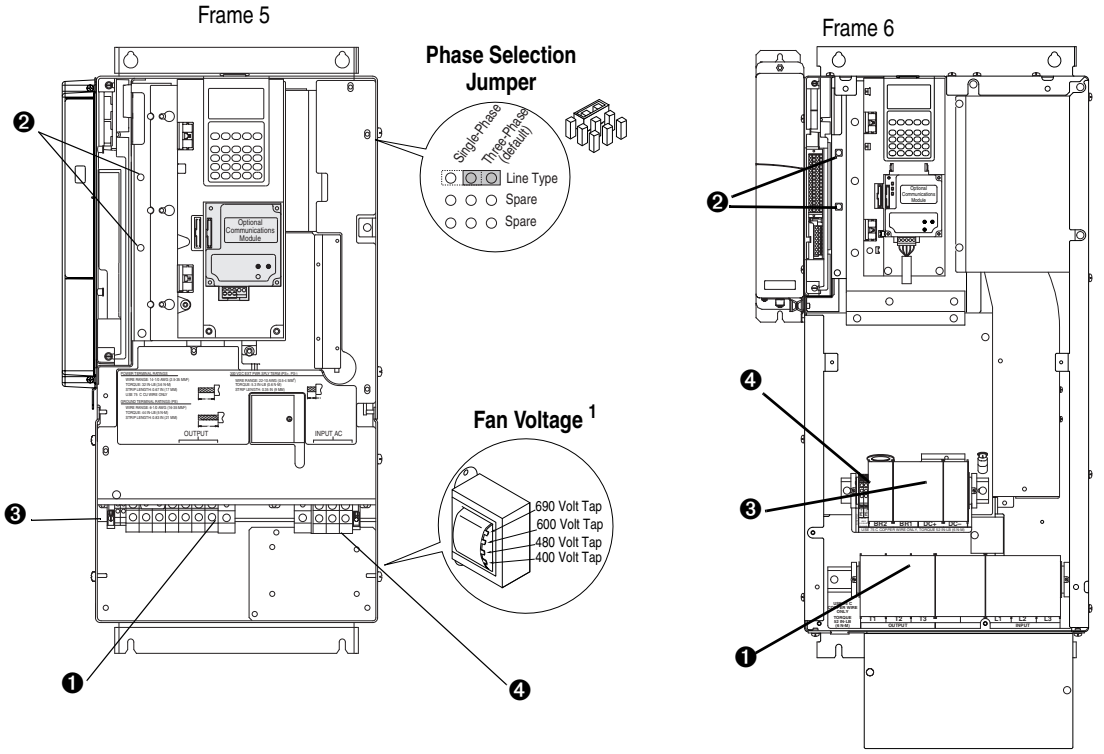


Table D Power Terminal Block Specifications

No.	Name	Frame	Description	Wire Size Range(1)		Torque		Terminal Bolt Size(2)
				Maximum	Minimum	Maximum	Recommended	
❶	Power Terminal Block	1	Input power and motor connections	4.0 mm^2 (10 AWG)	0.5 mm^2 (22 AWG)	1.7 N-m (15 lb.-in.)	0.8 N-m (7 lb.-in.)	—
		2	Input power and motor connections	10.0 mm^2 (6 AWG)	0.8 mm^2 (18 AWG)	1.7 N-m (15 lb.-in.)	1.4 N-m (12 lb.-in.)	—
		3	Input power and motor connections	25.0 mm^2 (3 AWG)	2.5 mm^2 (14 AWG)	3.6 N-m (32 lb.-in.)	1.8 N-m (16 lb.-in.)	—
			BR1, BR2	10.0 mm^2 (6 AWG)	0.8 mm^2 (18 AWG)	1.7 N-m (15 lb.-in.)	1.4 N-m (12 lb.-in.)	—
		4	Input power and motor connections	35.0 mm^2 (1/0 AWG)	10 mm^2 (8 AWG)	4.0 N-m (24 lb.-in.)	4.0 N-m (24 lb.-in.)	—
❷	SHLD Terminal	1-4	Terminating point for wiring shields	—	—	1.6 N-m (14 lb.-in.)	1.6 N-m (14 lb.-in.)	—
❸	AUX Terminal Block	1-4	Auxiliary Control Voltage(3) PS+, PS-	1.5 mm^2 (16 AWG)	0.2 mm^2 (24 AWG)	—	—	—

(1) Maximum/minimum sizes that the terminal block will accept - these are not recommendations.
(2) Apply counter torque to the nut on the other side of terminations when tightening or loosening the terminal bolt in order to avoid damage to the terminal.
(3) External control power: UL Installation - 300V DC, ±10%, Non UL Installation - 270-600V DC, ±10%. Frame 1-6, 100 W

Figure 8 Power Terminal Block Location, Cont'd



Fan VA Rating - Common Bus Only

Frame	Fan Voltage *(120V or 240V)*
5	100 VA
6	138 VA

[1] Frame 5 & 6 utilize a transformer to match the input line voltage to the internal fan voltage. If you line voltage is different then the voltage class specified on the drive nameplate, it may be necessary to change the transformer taps. The taps are shown in the inserts of frames 5 & 6.
Common Bus drives require user supplied 120V or 240V to power the cooling fans. Power source is connected between "0V AC" and the terminal corresponding to your source voltage.

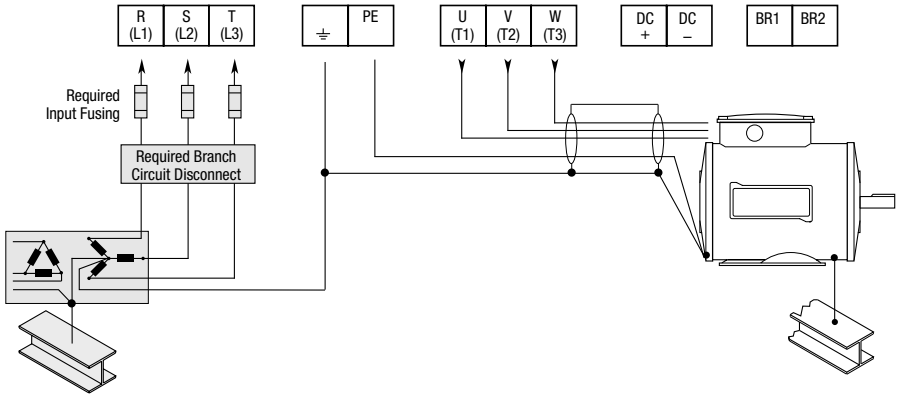
Table E Power Terminal Block Specifications

No.	Name	Frame	Description	Wire Size Range[1] Maximum	Wire Size Range[1] Minimum	Torque Maximum	Torque Recommended	Terminal Bolt Size[2]
❶	Power Terminal Block	5 (75 HP)[3]	R, S, T, BR1, BR2, DC+, DC-, U, V and W	50.0 mm^2 (1/0 AWG)	2.5 mm^2 (14 AWG)	See Note [4]	See Note [4]	—
			PE	50.0 mm^2 (1/0 AWG)	4.0 mm^2 (12 AWG)			—
		5 (100 HP)[3]	R, S, T, DC+, DC-, U, V and W	70.0 mm^2 (2/0 AWG)	16.0 mm^2 (6 AWG)			—
			BR1, BR2	50.0 mm^2 (1/0 AWG)	2.5 mm^2 (14 AWG)			—
			PE	50.0 mm^2 (1/0 AWG)	4.0 mm^2 (12 AWG)			—
		6	Input power and motor connections	120.0 mm^2 (4/0 AWG)	2.5 mm^2 (14 AWG)	6 N-m (52 lb.-in.)	6 N-m (52 lb.-in.)	—
❷	SHLD Terminal	5-6	Terminating point for wiring shields	—	—	1.6 N-m (14 lb.-in.)	1.6 N-m (14 lb.-in.)	—
❸	AUX Terminal Block	5-6	Auxiliary Control Voltage[5] PS+, PS-	4.0 mm^2 (10 AWG)	0.5 mm^2 (22 AWG)	0.6 N-m (5.3 lb.-in.)	0.6 N-m (5.3 lb.-in.)	—
❹	Fan Terminal Block (Common Bus Only)	5-6	User Supplied Fan Voltage 0V AC, 120V AC, 240V AC	4.0 mm^2 (10 AWG)	0.5 mm^2 (22 AWG)	0.6 N-m (5.3 lb.-in.)	0.6 N-m (5.3 lb.-in.)	—

(1) Maximum/minimum sizes that the terminal block will accept - these are not recommendations.
(2) Apply counter torque to the nut on the other side of terminations when tightening or loosening the terminal bolt in order to avoid damage to the terminal.
(3) Not all terminals present on all drives.
(4) Refer to the terminal block label inside the drive.
(5) External control power: UL Installation - 300V DC, ±10%, Non UL Installation - 270-600V DC, ±10%. Frame 1-6, 100 W

Power & Ground Wiring

Figure 9 Power and Ground Wiring



Important Common Bus (DC Input) Application Notes

1. If drives without internal precharge are used (Frames 5 & 6 only), then:

a) precharge capability must be provided in the system to guard against possible damage, and

b) disconnect switches **Must Not** be used between the input of the drive and a common DC bus without the use of an external precharge device.

2. If drives with internal precharge (Frames 1-6) are used with a disconnect switch to the common bus, then:

a) an auxiliary contact on the disconnect must be connected to a digital input of the drive. The corresponding input (parameter 361-366) must be set to option 30, “Precharge Enable.” This provides the proper precharge interlock, guarding against possible damage to the drive when connected to a common DC bus. The drive must have firmware version 2.002 or above (Standard & Vector Control).

Power Terminal Block Designations

Terminal	Description	Notes
BR1	DC Brake (+)	Dynamic Brake Resistor Connection (+)
BR2	DC Brake (–)	Dynamic Brake Resistor Connection (–)
DC+	DC Bus (+)	DC Input Power or Dynamic Brake Chopper
DC–	DC Bus (–)	DC Input Power or Dynamic Brake Chopper
PE	PE Ground	Refer to Figure 9 on page 17 for location on Frame 3 drives
⏚	Motor Ground	Refer to Figure 7 on page 15 for location on Frame 3 drives
U	U (T1)	To motor
V	V (T2)	To motor
W	W (T3)	To motor
R	R (L1)	AC Line Input Power
S	S (L2)	AC Line Input Power
T	T (L3)	AC Line Input Power

Using PowerFlex 700S Drives with Regen Power Units

If a Regenerative unit (i.e., 1336 REGEN) is used as a bus supply or a brake, the common mode capacitors should be disconnected. Refer to the *PowerFlex 700S Drives with Phase II Control User Manual*, publication 20D-UM006, for information on removing common mode capacitors.

Regenerative Unit to Drive Connections

Regenerative Brake Mode

	Terminals	
Frame(s)	**1336 Regen**	**PowerFlex 700S**
1 - 4	DC+ & DC-	BR1 & DC-
5 & 6	DC+ & DC-	DC+ & DC-

Regenerative Bus Supply Mode

	Terminals	
Frame(s)	**1336 Regen**	**PowerFlex 700S**
1 - 4	DC+ & DC-	DC+ & DC-
5 & 6	DC+ & DC-	DC+ & DC- of the Common Bus Drives

Refer to *1336 REGEN Line Regeneration Package User Manual*, publication 1336-REGEN-5.0, for more information.

Step 4 Control Wiring

Wiring Recommendations

- Always use tinned copper wire.
- Wire with an insulation rating of 600V or greater is recommended.
- Control and signal wires should be separated from power wires by at least 0.3 meters (1 foot).
- 4100CCF3 Flex I/O cable for use with DriveLogix is 3 ft. maximum length.

Important: I/O terminals labeled "(–)" or "Common" are not referenced to earth ground and are designed to greatly reduce common mode interference. Grounding these terminals can cause signal noise.

ATTENTION: Hazard of personal injury or equipment damage exists when using bipolar input sources. Noise and drift in sensitive input circuits can cause unpredictable changes in motor speed and direction. Use speed command parameters to help reduce input source sensitivity.

Table F Recommended Control Wire

Type		Wire Type(s)	Description	Insulation Rating
Digital I/O	Un-shielded	Per US NEC or applicable national or local code	–	300V, 60° C (140° F), Minimum
	Shielded	Multi-conductor shielded cable such as Belden 8770 (or equiv.)	0.750 mm^2 (18 AWG), 3 conductor, shielded.	
Standard Analog I/O	Belden 8760/9460 (or equiv.)		0.750 mm^2 (18 AWG), twisted pair, 100% shield with drain (5).	300V, 75-90 °C (167-194 °F)
Remote Pot	Belden 8770 (or equiv.)		0.750 mm^2 (18 AWG), 3 cond., shielded	
Encoder/ Pulse I/O Less 30.5 m (100 ft.)	Combined:	Belden 9730 (or equivalent) (1)	0.196 mm^2 (24 AWG), individually shielded.	
Encoder/ Pulse I/O 30.5 m (100 ft.) to 152.4 m (500 ft.)	Signal:	Belden 9730/9728 (or equivalent) (1)	0.196 mm^2 (24 AWG), individually shielded.	
	Power:	Belden 8790 (2)	0.750 mm^2 (18 AWG)	
	Combined:	Belden 9892 (3)	0.330 mm^2 or 0.500 mm^2 (3)	
Encoder/ Pulse I/O 152.4 m (500 ft.) to 259.1 m (850 ft.)	Signal:	Belden 9730/9728 (or equivalent) (1)	0.196 mm^2 (24 AWG), individually shielded.	
	Power:	Belden 8790 (2)	0.750 mm^2 (18 AWG)	
	Combined:	Belden 9773/9774 (or equivalent) (4)	0.750 mm^2 (18 AWG), individually shielded pair.	
EMC Compliance	Refer to EMC Instructions on page 5 for details.			

(1) Belden 9730 is 3 individually shielded pairs (2 channel plus power). If 3 channel is required, use Belden 9728 (or equivalent).
(2) Belden 8790 is 1 shielded pair.
(3) Belden 9892 is 3 individually shielded pairs (3 channel), 0.33 mm^2 (22 AWG) plus 1 shielded pair 0.5 mm^2 (20 AWG) for power.
(4) Belden 9773 is 3 individually shielded pairs (2 channel plus power). If 3 channel is required, use Belden 9774 (or equivalent).
(5) If the wires are short and contained within a cabinet which has no sensitive circuits, the use of shielded wire may not be necessary, but is always recommended.

DIP Switch Settings

Figure 10 Main Control Board Dip Switches

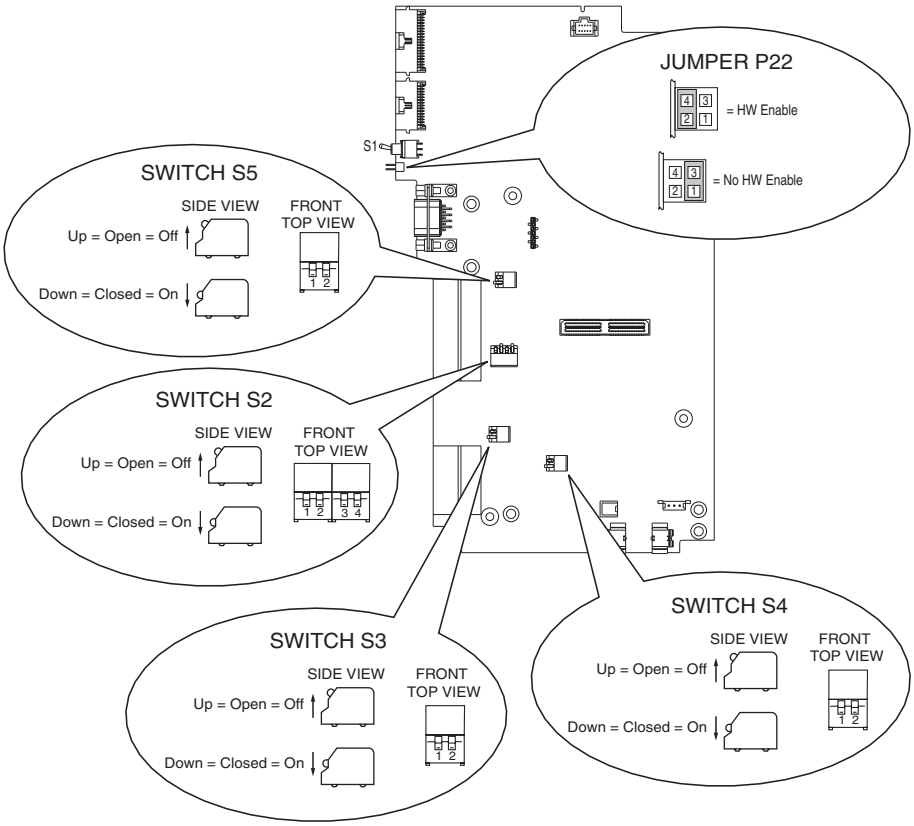


Table G Switch Settings

Function	Switch	Open	Closed	Default	Notes
Configuring Digital Input 6 for Hardware Enable (HW Enbl)	P22 Jumper	pin 2-4 HW Enbl	pin 1-3 No Enbl	pin 2-4 HW Enbl	No Jmpr = HW Enbl
Analog Input 1	S5-2	Voltage	Current	Voltage	Change with Power Off
Analog Input 2	S5-1	Voltage	Current	Voltage	Change with Power Off
Digital Inputs 4-6 Voltage	S4-1,2	115V AC	24V DC	24V DC	Change with Power Off
Digital Input 1 Voltage	S3-1	24V DC	12V DC	24V DC	Change with Power Off
Digital Input 2 Voltage	S3-2	24V DC	12V DC	24V DC	Change with Power Off
Encoder Supply Voltage	S2-4	12V DC	5V DC	12V DC	Change with Power Off Set all switches the same
Encoder Signal A Voltage	S2-1	12V DC	5V DC	12V DC	
Encoder Signal B Voltage	S2-2	12V DC	5V DC	12V DC	
Encoder Signal Z Voltage	S2-3	12V DC	5V DC	12V DC	

Function	Switch	Up	Center	Down	Notes
DriveLogix Processor	S1	Prog	Remote	Run	Processor Mode

Please note there are two separate values for an encoder.

I/O Terminal Blocks

Wiring the Main Control Board I/O Terminals

Terminal blocks TB1 and TB2 contain connection points for all inputs, outputs and standard encoder connections. When installed, both terminal blocks reside on the Main Control Board. These components are provided with the drive but are not factory installed.

Make the terminal block wire connections.

Important: For NEMA 1 applications, all wiring must be routed through the conduit plate on the drive. Route any wires from the expanded cassette to the base cassette and out of the drive.

When wiring is complete, install the plug.

Table H Control & Encoder Terminal Block Specifications

Name	Frame	Description	Wires Size Range[1]		Torque	
			Maximum	Minimum	Maximum	Recommended
I/O Blocks	1-6	Signal & Encoder power connections	1.5 mm^2 (16 AWG)	.14 mm^2 (28 AWG)	.25 N-m (2.2 lb.-in.)	.22 N-m (1.9 lb.-in.)

(1) Maximum/minimum sizes the terminal block will accept - these are not recommendations.

Main Control Board I/O Terminal Locations

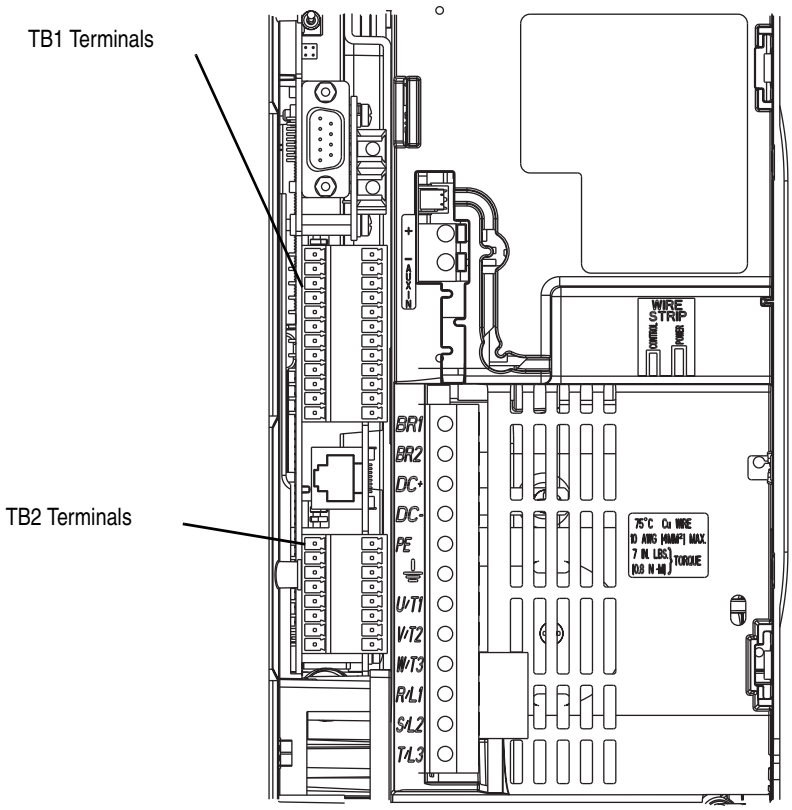
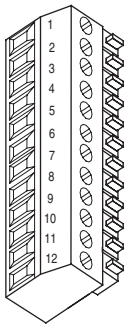
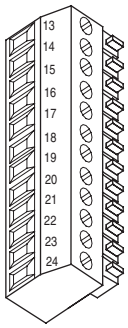


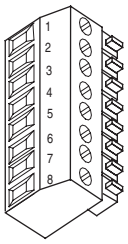
Table I TB1 Terminals

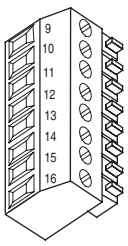




Terminal	Signal	Factory Default	Description	Related Parameter
1	Analog Input 1 Comm.	(Volt)	Bipolar, differential input, +/-10V, 0-20 mA, 13 bit + sign 20k Ohm impedance at Volt; 500 Ohm impedance at mA	
2	Analog Input 1 (+/-)			
3	Shield	NA	Analog Input Shield	
4	Analog Input 2 Comm.	(Volt)	Bipolar, differential input, +/-10V, 0-20 mA, 13 bit + sign 20k Ohm impedance at Volt; 500 Ohm impedance at mA	
5	Analog Input 2 (+/-)			
6	Analog Input 3 [NTC-] Comm.	(Volt)	Differential input, 0-10V, 10 bit (for motor control mode FOC2, this is the temperature adaptation input).	
7	Analog Input 3 [NTC+]			
8	Shield	NA	Analog Output Shield	
9	Analog Output 1 (-)	(Volt)	Bipolar, differential output, +/-10V, 0-20 mA, 11 bit + sign 2k Ohm minimum load	
10	Analog Output 1 (+)			
11	Analog Output 2 (-)	(Volt)		
12	Analog Output 2 (+)			
13	+10V Reference	NA	Rating: 20 mA maximum load (Recommend 5k Ohm pot)	
14	Reference Common	NA		
15	-10V Reference	NA		
16	Encoder A	NA	Normal current draw per channel: 20 mA	
17	Encoder A (Not)	NA		
18	Encoder B	NA		
19	Encoder B (Not)	NA		
20	Encoder Z	NA		
21	Encoder Z (Not)	NA		
22	Encoder Reference (+)	NA	12 or 5V DC power supply for primary encoder interface Rating: 300 mA maximum	
23	Encoder Reference (-)	NA		
24	Encoder Shield	NA	Connection point for encoder shield	

Table J TB2 Terminals

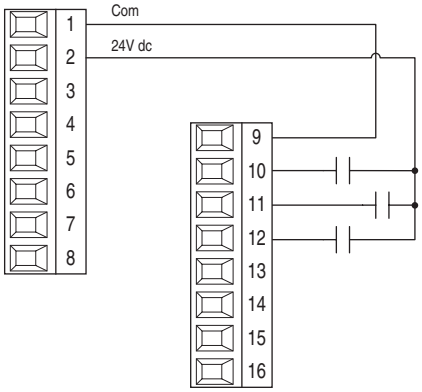
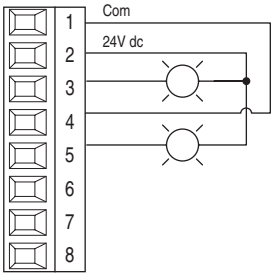
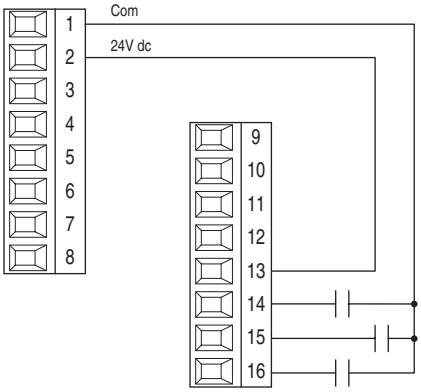
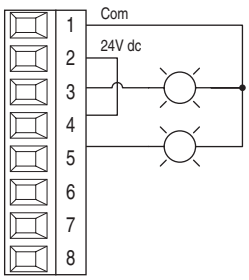




Terminal	Signal	Factory Default	Description	Related Parameter
1	24V DC Common (-)	NA	Drive supplied 24V DC logic input power Rating: 300 mA maximum load	
2	24V DC Source (+)	NA		
3	Digital Output 1		24V DC Open Collector (sinking logic) Rating: Internal Source = 150 mA max. External Source = 750 mA	
4	Digital Output 1/2 Com	NA	Common for Digital Output 1 & 2	
5	Digital Output 2		24V DC Open Collector (sinking logic) Rating: Internal Source = 150 mA max. External Source = 750 mA	
6	Relay Output 3 (NC)		Relay contact output Rating: 115V AC or 24V DC = 2 A max. Inductive/Resistive	
7	Relay Output 3 Com	NA		
8	Relay Output 3 (NO)			
9	Digital Input 1-3 Com	NA	Common for Digital Inputs 1-3	
10	Digital Input 1		High speed 12-24V DC sourcing Digital Input Load:15 mA at 24V DC	
11	Digital Input 2			
12	Digital Input 3		Load:15 mA at 24V DC sourcing	
13	Digital Input 4-6 Com	NA	Common for Digital Inputs 4-6	
14	Digital Input 4		Load: 10 mA at 24V DC sinking/sourcing Load: 7.5 mA at 115V AC	
15	Digital Input 5			
16	Digital Input 6	HW Enable		

I/O Wiring Examples

Table K TB2 Terminals — Digital Wiring Examples

Input/Output	Connection Example
Digital Inputs used for enable and precharge control. *Note:* **24V DC Supply** - supports only on-board digital inputs. Do not use for circuits outside the drive. *Note*: The factory default for all Digital Inputs is 24V. To use 115V on Digital Inputs 4-6 see Table I. *Note*: Digital Inputs 1-3 are always 12V or 24V DC.	Sourcing Digital Inputs - Internal Power Supply  Sourcing Digital Outputs - Internal Power Supply  Sinking Digital Inputs - Internal Power Supply  Sinking Digital Output - Internal Power Supply 

Sourcing and Sinking Definitions

The digital inputs and digital outputs of the PowerFlex 700S AC drive support Sourcing or Sinking configuration. Typically, digital inputs are sourcing devices and digital outputs are sinking devices. The following definitions apply throughout this section:

- **Sourcing a Digital Input** - The digital input common (return) is connected to the power supply common. Applying a positive voltage to the digital input will cause it to activate (pull up).
- **Sinking a Digital Input** - The digital input common (return) is connected to the power supply positive voltage. Applying 0V or common to the digital input will cause it to activate (pull down).
- **Sinking a Digital Output** - The digital output common (return) is connected to the power supply common. The device to be controlled by the digital output is connect to the positive voltage and the device common is connected to the digital output.
- **Sinking a Digital Output** - The digital output common (return) is connected to the power supply positive voltage. The digital output is connect to the device to be controlled and the device common is connected to the power supply common.

Note:
Digital Inputs 1-3 can only be configured as sourcing inputs. Digital Inputs 4-6 can be configured as sourcing or sinking inputs.

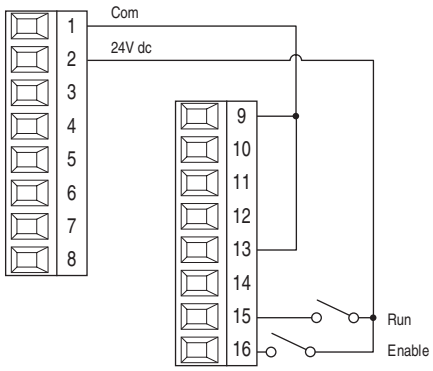
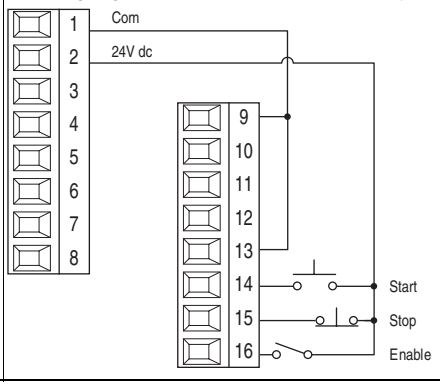
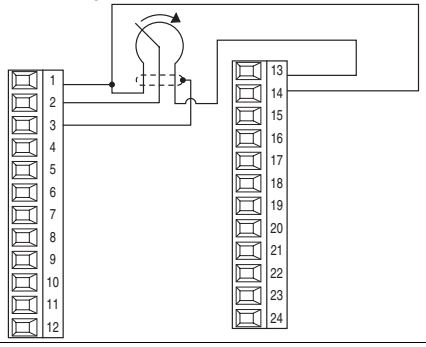
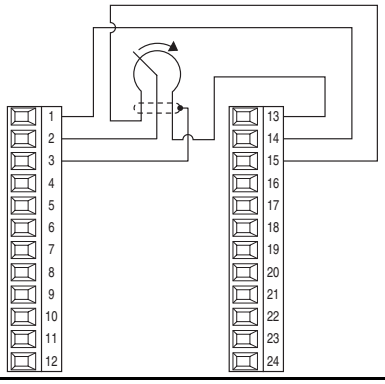
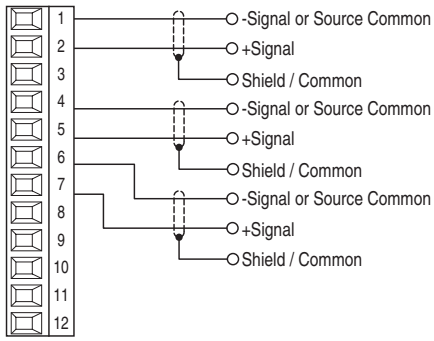
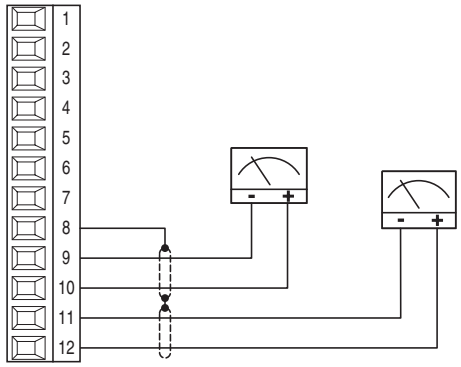
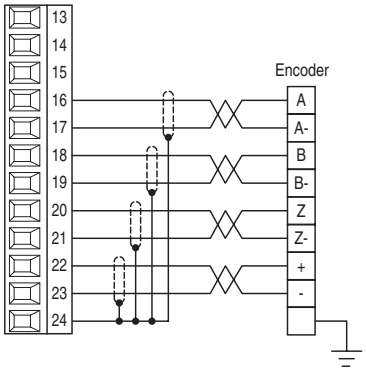
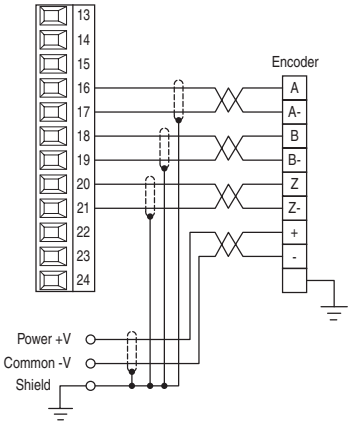
Input/Output	Connection Example	
Digital Inputs 24V DC	Sourcing Digital Inputs - Internal Power Supply, 2-Wire Control 	**Required Parameter Changes** • Set Par 829 [Dig In5 Sel] to value 7 - “Run”. • Par 153 [Control Options], bit 8 [3WireControl] will automatically be off (0) for 2-wire control. • Set Par 168 [Normal Stop Mode] for the desired stopping mode: 0 = Ramp Stop 1 = CurLim Stop 2 = Coast Stop
Digital Inputs 24V DC	Sourcing Digital Inputs- Internal Power Supply, 3-Wire 	• Set Par 829 [Dig In5 Sel] to value 14 - “Normal Stop”. • Set Par 828 [Dig In4 Sel] to value 5 - “Start”. • Par 153 [Control Options], bit 8 [3WireControl] will automatically be on (1) for 3-wire control. • Set Par 168 [Normal Stop Mode] for the desired stopping mode: 0 = Ramp Stop 1 = CurLim Stop 2 = Coast Stop

Table L TB1 Terminals— Analog Wiring Examples

Input/Output	Connection Example	Required Parameter Changes
0-10V Analog Input	0-10V Analog Input - Internal Source 	
0-10V Analog Input	0-10V Analog Input - Bi-Polar 	

Input/Output	Connection Example	Required Parameter Changes
0-10V Analog Input	0-10V Analog Input - External Source 	
Analog Output - +/-10V DC Used to drive analog meters displaying speed and current	0-10V Analog Output 	**Using Analog Out 1, -10V to + 10V to meter Motor RPM and direction:** • Send the data to the Analog Output Par 833 [Anlg Out1 Real] (the destination) linked to Par 71 [Filtered SpdFdbk] (the source) • Scale the Output to the source parameter Par 835 [Anlg Out1 Scale] = 175 (Par 4 [Motor NP RPM] = 1750 / 10V) **Using Analog Out 2, -10V to + 10V to meter Motor Current:** • Send the data to the Analog Output Par 840 [Anlg Out2 Real] (the destination) linked to Par 308 [Output Current] (the source) • Scale the Output to the source parameter Par 822 [Anlg Out2 Scale] = xx (Par 2 [Motor NP FLA] / 10 V Output)
Primary Encoder Interface - Supports 12V DC differential encoders with internal power supply. 5V DC differential encoders require external power supply and special jumper settings. Used as primary closed loop speed feedback	Primary Encoder - Internal Supply 	**Using Encoder 0 as speed feedback:** • Par 222 [Motor Fdkbk Sel] = 0 - “Encoder 0” (default) • Par 232 [Encoder0 PPR] = Pulses/Rev for installed encoder
	Primary Encoder - External Supply 	

Step 5 Start-Up Check List

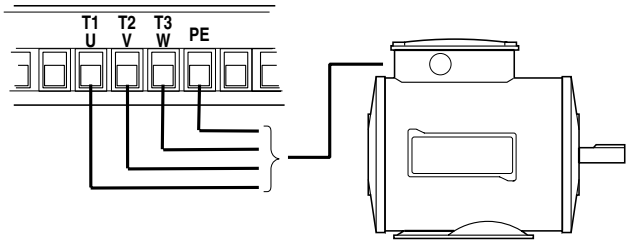
This section describes how you start-up the PowerFlex® 700S.

ATTENTION: Power must be applied to the drive to perform the following start-up procedure. Some of the voltages present are at incoming line potential. To avoid electric shock hazard or damage to equipment, only qualified service personnel should perform the following procedure. Thoroughly read and understand the procedure before beginning. If an event does not occur while performing this procedure, **Do Not Proceed**. **Remove Power** including user supplied control voltages. User supplied voltages may exist even when main AC power is not applied to then drive. Correct the malfunction before continuing.

Important: If you have a DriveLogix™ application, you must first connect the battery before starting this section.

Before Applying Power to the Drive

❑ **1.** Confirm that motor wires are connected to the correct terminals and are secure.

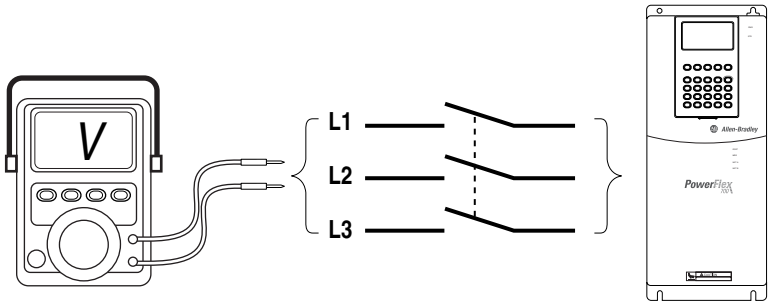


❑ **2.** Confirm that encoder wires are connected to the correct terminals and are secure.

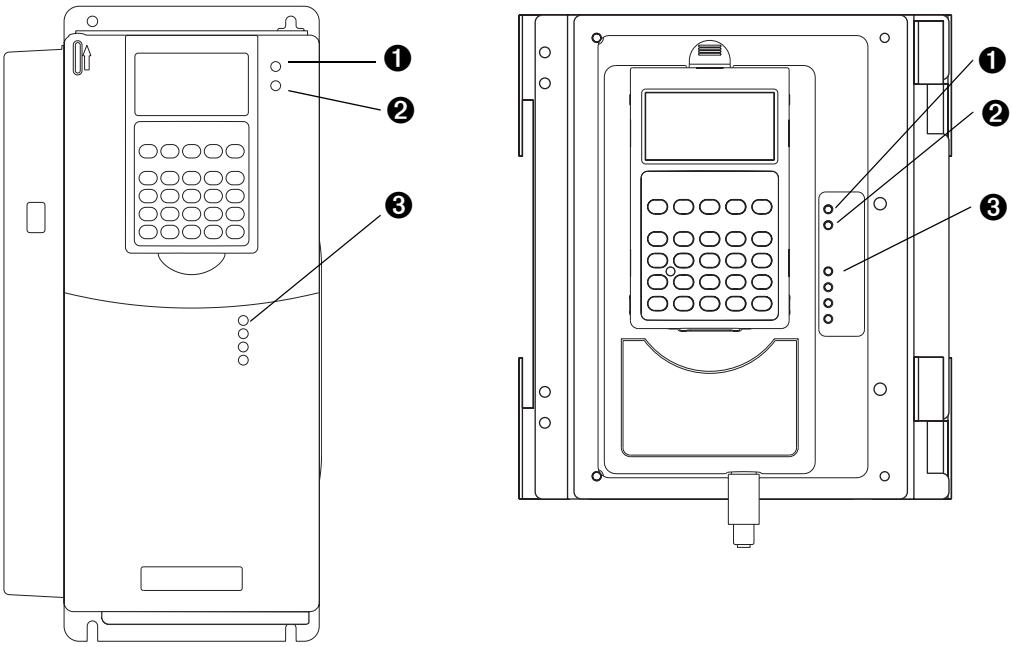
❑ **3.** Confirm that all control inputs are connected to the correct terminals and are secure.

❑ **4.** Verify that AC line power at the disconnect device is within the rated value of the drive.

❑ **5.** Verify that supply voltage is correct.



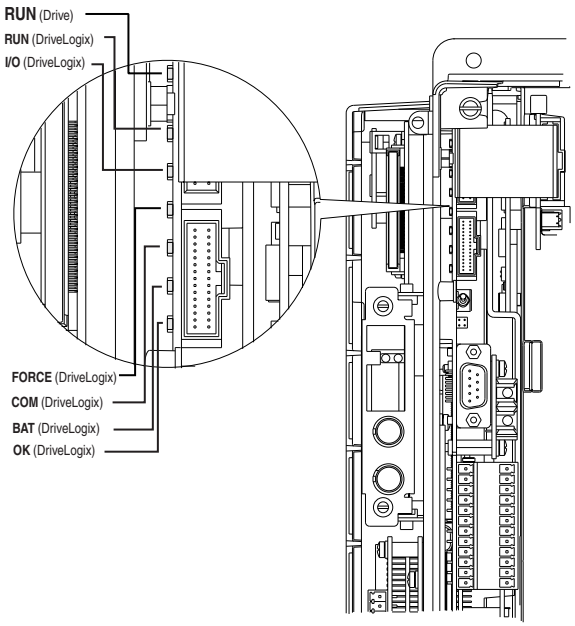
The remainder of this procedure requires a Human Interface Module (HIM) be installed. If an operator interface is not available, remote devices should be used to start-up the drive.



Refer to Table M: "Drive Status Indicator Descriptions" on page 28 for an explanation of the LEDs identified in these illustrations.

The RUN LED and the controller LEDs are only operational when the drive is energized. These LEDs are only visible when the drive door is open or when viewed from the HIM or from an application program (e.g., DriveExplorer™) in parameter 554 [LED Status]. This feature is only available with DriveLogix version 15.03 or later.

ATTENTION: The RUN LED and the controller LEDs are only operational when the drive is energized, and are visible with the drive door open. Servicing energized equipment can be hazardous. Severe injury or death can result from electrical shock, burn or unintended actuation of controlled equipment. Follow Safety related practices of NFPA 70E, *ELECTRICAL SAFETY FOR EMPLOYEE WORKPLACES*. DO NOT work alone on energized equipment!



Applying Power to the Drive

6. Apply AC power and control voltages to the drive. Examine the *Power (PWR)* LED.

Table M Drive Status Indicator Descriptions

		#	Name	Color	State	Description
DRIVE	Power Structure	❶	PWR (Power)	Green	Steady	Illuminates when power is applied to the drive.
		❷	STS (Status)	Green	Flashing	Drive ready, but not running & no faults are present.
					Steady	Drive running, no faults are present.
				Yellow	Flashing	When running, a type 2 (non-configurable) alarm condition exists, drive continues to run. When stopped, a start inhibit exists and the drive cannot be started.
					Steady	A type 1 (user configurable) alarm condition exists, but drive continues to run.
				Red	Flashing	A fault has occurred.
					Steady	A non-resettable fault has occurred.
				Red / Yellow	Flashing Alternately	The drive is in flash recovery mode. The only operation permitted is flash upgrade.
	Control Assembly / Communications	❸	PORT	Refer to the *Communication Adapter User Manual*		Status of DPI port internal communications (if present).
			MOD			Status of communications module (when installed).
			NET A			Status of network (if connected).
			NET B			Status of secondary network (if connected).

❑ **7.** Examine the *Status (STS)* LED. Verify that it is flashing green. If it is not in this state, check the following possible causes and take the necessary corrective action.

Table N Common Causes of a Pre-Start Alarm

Examine Parameter 156 [Run Inhibit Status]			
bit	**Description**		**Action**
1	No power is present at the Enable Terminal TB2 - T16		Apply the enable
2, 3, 4	A stop command is being issued		Close all stop inputs
5	Power loss event is in progress, indicating a loss of the AC input voltage		Restore AC power
6	Data supplied by the power structure EEprom is invalid or corrupt.		Cycle power (wait five (5) minutes before re-applying power to the drive). If problem persists, replace the power structure.
7	Flash Update in Progress		Complete Flash Procedures
8	Drive is expecting a Start Edge and is receiving a continuous signal.		Open all start buttons and remove all start commands
9	Drive is expecting a Jog Edge and is receiving a continuous signal.		Open all jog buttons and remove all jog commands
10	A conflict exists between the Encoder PPR programming (Par 232 or 242) and the encoder configuration for edge counts (Par 233 or 243, bits 4 & 5).		Verify encoder data and reprogram
11	The drive cannot precharge because a precharge input is programmed and no signal is present.		Reprogram the input or close the precharge control contact.
12	Digital Configuration	Start input configured but stop not configured	Program Par 838-840 to include a stop button, rewire the drive
		Run input configured but control options do not match	Program Par 153, Bit 8 to “0” (2 wire control)
		Start input configured but control options do not match	Program Par 153, Bit 8 to “1” (3 wire control)
		Multiple inputs configured as Start or Run	Reprogram Par 838-840 so multiple starts, multiple runs or any combination do not exist
		Multiple inputs configured as Jog1	Reprogram Par 838-840 so only (1) is set to Jog1
		Multiple inputs configured as Jog2	Reprogram Par 838-840 so only (1) is set to Jog2
		Multiple inputs configured as Fwd/Rev	Reprogram Par 838-840 so only (1) is set to Fwd/Rev
14	Invalid Feedback Device for Permanent Magnet Motor Control		Set Par 222 to Value 5 (FB Opt Port0)

Table O Common Start-Up Faults

Fault	Description	Action
Encoder Loss	One of the following has occurred on an encoder: • missing encoder (broken wire) • quadrature error • phase loss	Reconnect encoder or replace encoder.
Motor Overload	A motor overload is pending.	Enter correct motor nameplate full load amps. *Par 2* [Motor NP FLA] or reduce excess load.
Motor Poles Fault	The poles of the motor do not match its rating.	Enter correct motor nameplate RPM. *Par 4* [Motor NP RPM]

- If any digital input is configured to Stop - CF (CF=Clear Faults) verify the signal is present or the drive will not start. Refer to *Chapter 4 - Troubleshooting* in the *PowerFlex® 700S Drives with Phase II Control User Manual*, publication 20D-UM006, for a list of potential digital input conflicts.
- If a fault code appears, Refer to *Chapter 4 - Troubleshooting* in the *PowerFlex® 700S Drives with Phase II Control User Manual*, publication 20D-UM006, for a list of fault codes, descriptions and actions.

The STS LED should be flashing green at this point.

❑ **8.** Proceed to *Step 6 - Program the Drive - Start-Up* (on the following page).

Step 6 Program the Drive – Start-Up

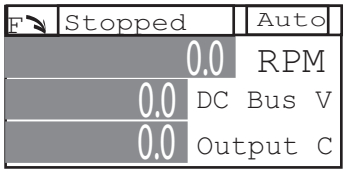
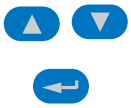
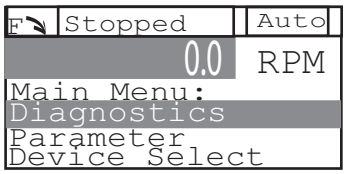
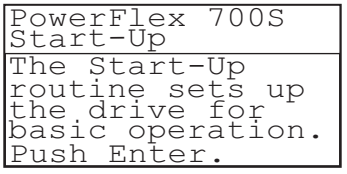
Assisted Start

This routine prompts you for information that is needed to start-up a drive for most applications, such as line and motor data, commonly adjusted parameters and I/O.

This start-up routine requires a HIM. If the drive is configured for 2-wire control, the HIM installed on the drive will also act as a 2-wire device. In 2-wire mode, the drive will start when the HIM “Start” is pressed and stop when the HIM “Start” is released. The recommended mode of use for a Start-Up Routine is 3-wire control, Parameter 153 [Control Options], Bit 8 set to “1”.

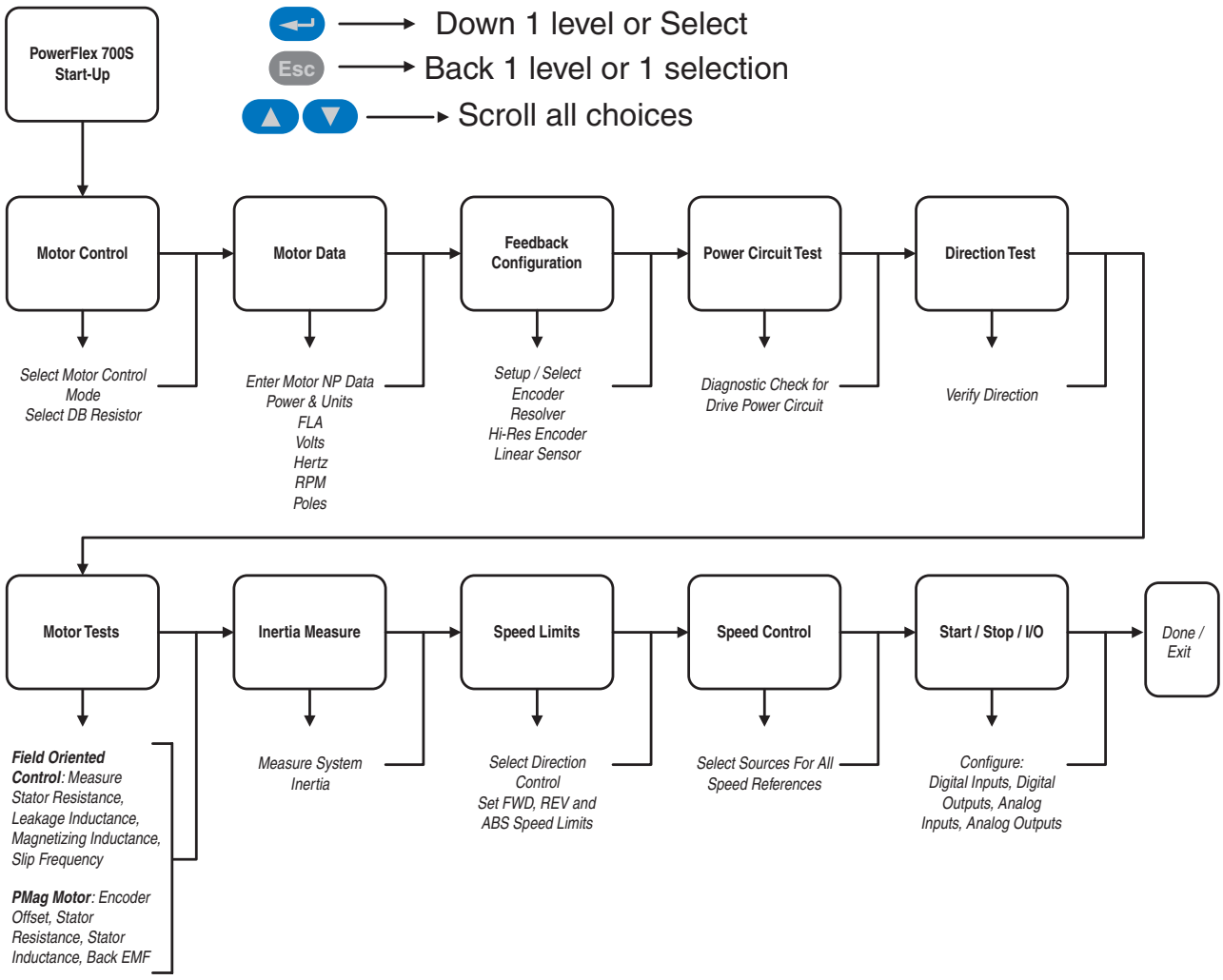
Important: When using Start-Up Assistant, always exit the Assistant before cycling power on the drive.

The assisted start-up routine asks simple yes or no questions and prompts you to input required information. Access Assisted Start-Up by selecting “Start-Up” from the Main Menu.

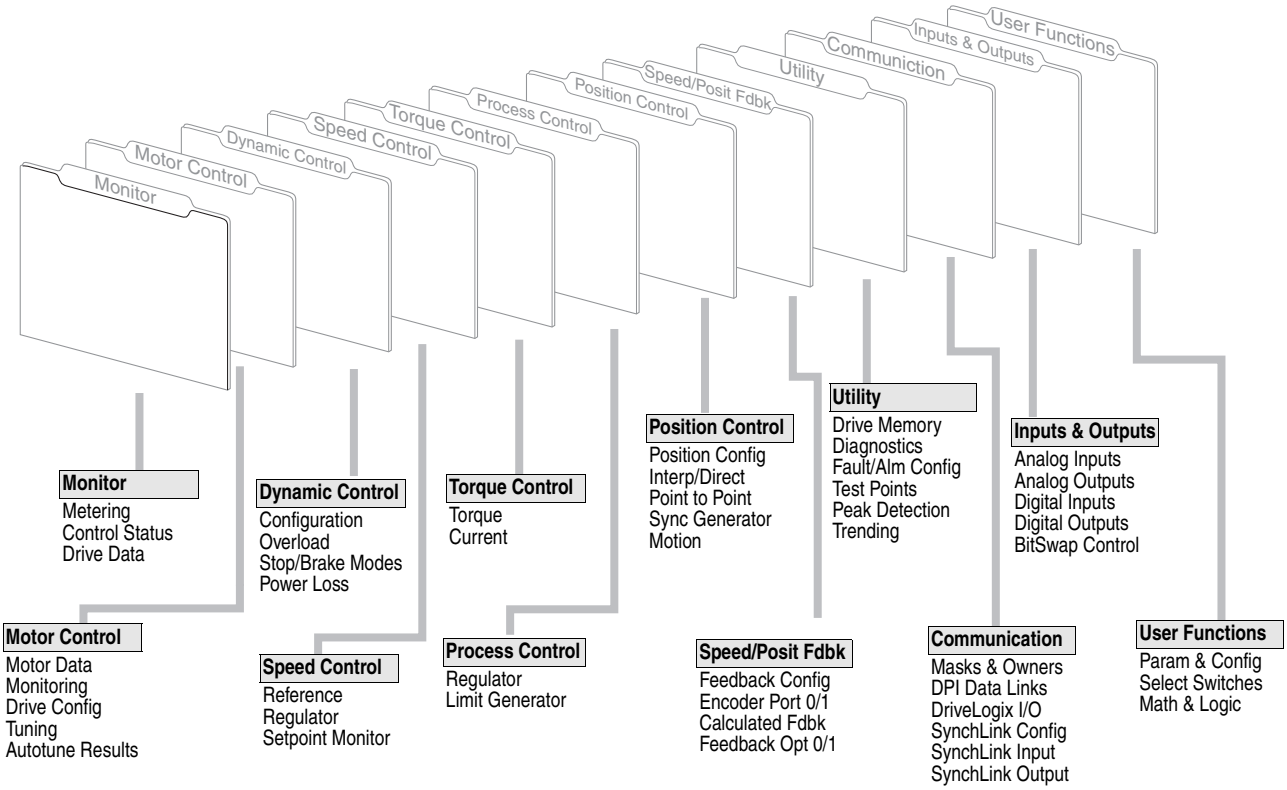
1. To exit the User Display screen Press Esc.		
1. In the Main Menu, use the Down Arrow to scroll to “Start Up”. 2. Press Enter. **TIP:** Throughout the Start-Up Routine many screens have more selections than shown. Use the arrow keys to scroll through all the menu options.		
1. Follow the instructions on the screen to complete the Start-Up.		

TIP: If using a HIM the following functions are not available.

- Alt-Man
- Alt-Lang
- Alt-SMART


PowerFlex 700S Start-Up
Down 1 level or Select
Esc
Back 1 level or 1 selection
Scroll all choices
Motor Control
Motor Data
Feedback Configuration
Power Circuit Test
Direction Test
Select Motor Control Mode
Select DB Resistor
Enter Motor NP Data
Power & Units
FLA
Volts
Hertz
RPM
Poles
Setup / Select
Encoder
Resolver
Hi-Res Encoder
Linear Sensor
Diagnostic Check for Drive Power Circuit
Verify Direction
Motor Tests
Inertia Measure
Speed Limits
Speed Control
Start / Stop / I/O
Done / Exit
Field Oriented Control: Measure Stator Resistance, Leakage Inductance, Magnetizing Inductance, Slip Frequency
PMag Motor: Encoder Offset, Stator Resistance, Stator Inductance, Back EMF
Measure System Inertia
Select Direction Control
Set FWD, REV and ABS Speed Limits
Select Sources For All Speed References
Configure:
Digital Inputs, Digital Outputs, Analog Inputs, Analog Outputs

Parameter Files & Groups



Frequently Used Parameters

Footnote definitions are found on page 35.

No.(1)	Name Description (2)	Values (3)		Linkable	Read-Write	Data Type
1	**Motor NP Volts** Set to the motor nameplate rated volts.	Units: Default: Min/Max:	Volt Calculated 75/705		RW	16-bit Integer
2	**Motor NP FLA** Set to the motor nameplate rated full load amps. Range limited by three-second inverter rating.	Units: Default: Min/Max:	Amps Calculated Calculated/Calculated		RW	Real
3	**Motor NP Hertz** Set to the motor nameplate rated frequency.	Units: Default: Min/Max:	Hz Calculated 2.0000/500.0000		RW	Real
4	**Motor NP RPM** Set to the motor nameplate rated RPM.	Units: Default: Min/Max:	RPM Calculated 1/30000		RW	16-bit Integer
5	**Motor NP Power** Set to the motor nameplate rated power.	Units: Default: Min/Max:	Hp Calculated 0.2500/3500.0000		RW	Real
6	**Mtr NP Pwr Units** The power units shown on the motor nameplate.	Default: Options:	0 Hp 0 Hp 1 W			
10	**Speed Ref 1** Sets the speed reference that the drive should use when selected by Parameter 16 [Speed Ref Sel]. A value of 1.0 represents base speed of the motor.	Default: Min/Max:	0.0000 -/+2200000000.0000	✓	RW	Real

No.[1]	Name Description [2]	Values [3]	Linkable	Read-Write	Data Type
27	**Speed Ref A Sel** Selects the speed reference source for the drive. The selected speed ref values converge in the final selection of the drives speed reference with Par 152 [Applied LogicCmd] and are selected with bits 28,29,30. See the Block Diagrams in Appendix B of the *PowerFlex 700S with Phase II Control User Manual*, publication 20D-UM006, for a description.	Default: 1 "Spd Ref 1" Options: 0 "Zero Speed" 1 "Speed Ref 1" 2 "Speed Ref 2" 3 "Sum SRef 1+2" 4 "Reserved" 5 "Preset Spd 1" 6 "Preset Spd 2" 7 "Preset Spd 3 8 "Preset Spd 4" 9 "Preset Spd 5" 10 "Preset Spd 6" 11 "Preset Spd 7" 12 "DPI Port 1" 13 "DPI Port 2" 14 "DPI Port 3" 15 "Reserved" 16 "DPI Port 5"			
30	**Min Spd Ref Lim** Sets the minimum speed reference limit. This value may be negative or positive but not greater than Par 31 [Max Spd Ref Lim].	Units: RPM Default: 0.00 Min/Max: -8.00/Par 31 [Max Spd Ref Lim] Scale: Par 4 [Motor NP RPM] = 1.0pu		RO	Real
31	**Max Spd Ref Lim** Sets the maximum speed reference limit. This value may be negative or positive but not less than Par 30 [Min Spd Ref Lim].	Units: RPM Default: 0.00 Min/Max: Par 30 [Min Spd Ref Lim]/8.00 Scale: Par 4 [Motor NP RPM] = 1.0pu		RO	Real
32	**Accel Time 1** Sets the rate of acceleration for all speed increases, with time in seconds to base speed. Accel Rate = Par 4 [Motor NP RPM] / Par 32 [Accel Time]	Units: Sec Default: 10.00 Min/Max: 0.010/6553.50 Type: Linkable Read-Write Real		RO	
33	**Decel Time 1** Sets the rate of deceleration for all speed decreases, with time in seconds to base speed. Decel Rate = Par 4 [Motor NP RPM] / Par 33 [Decel Time]	Units: Sec Default: 10.00 Min/Max: 0.010/6553.50	✓	RW	Real
34	**S Curve Time** Sets the S time (Round In and Round Out) in seconds. Half of the time specified is added to the beginning and half to the end of the applied ramp. The S time is independent of speed and results in a trapezoidal torque profile.	Units: Sec Default: 0.5 Min/Max: 0.0/4.0	✓	RW	Real
75	**Rev Speed Lim** Sets a limit on the speed reference in the negative direction. This value can be entered as a negative value or zero.	Units: RPM Default: -1.25 Min/Max: -8.00/0.00		RO	32-bit Integer
76	**Fwd Speed Lim** Sets a limit on the speed reference in the positive direction. This value can be entered as a positive value or zero.	Units: RPM Default: 1.25 Min/Max: 0.00/8.00		RO	Real
90	**Spd Reg BW** Sets the bandwidth of the speed regulator in rad/sec. Bandwidth is also referred to as the crossover frequency. Small signal time response is approximately 1/BW and is the time to reach 63% of set point. A change to this parameter will cause an automatic update of Parameters 81 [Spd Reg P Gain] and 82 [Spd Reg I Gain]. To disable the automatic gain calculation, set this parameter to a value of zero.	Units: R/S Default: 10.0000 Min/Max: 0.0000/500.0000 Comm Scale: x 1	✓	RW	Real
153	**Control Options** Set bits to configure the options for operating the drive.				

Options	Reserved	Sys Inrt En	Slip Test En	PM Offset En	Pwr Diag En	Trq Trim En	MC Atune En	Time Axis En	PITrim EnOut	Reserved	Inrt TrqLPEn	Motor OL Ret	Slip Comp	SpdRegPreset	Aux Pwr Sply	Auto Tach Sw	Reserved DM	Reserved DM	OL ClsLpDsbl	Jog -NoInteg	Iq Delay	Motor Dir	Reserved	3WireControl	Trq DsblZSpd	Trq StopRamp	Jog - NoRamp	Jog in Trq	Flying Start	SErrFilt1Stg	SRef LdLg En	Bipolar SRef
Default	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1
Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

0 = False
1 = True

222	**Mtr Fdbk Sel Pri** Enter a value to select the primary motor speed feedback device.	Default: 0 "Encoder 0" Options: 0 "Encoder 0" 1 "Encoder 1" 2 "Sensorless" 3 "Motor Fdbk" 4 "Motor Sim" 5 "FB Opt Port0In" 6 "FB Opt Port1"		
800	**Anlg In1 Data** Displays the scaled final value for Analog Input 1.	Default: 0.0000 Min/Max: -/+2200000000.0000	RO	Real

No.(1)	Name Description (2)	Values (3)	Linkable	Read-Write	Data Type
801	**Anlg In1 Value** Displays the actual input value at Analog Input 1. Analog Input 1 may be configured for voltage or current input signal. For proper selection of the input signal, the DIP switch and Par 821 [Analog I/O Units] must be set to match. Type of Input: Configurable, Voltage or Current Polarity: Bi-Polar Resolution: 14 bit (-8191 to +8191) AI 1 Voltage: DIP Switch S5-2 = Open; Analog I/O Units Par 821 Bit 0 = 0 (False) AI 1 Current: DIP Switch S5-2 = Closed; Analog I/O Units Par 821 Bit 0 = 1 (True)	Units: V/mA Default: 0V/4 mA Min/Max: -/+20.0000		RO	Real
802	**Anlg In1 Scale** Scales the range of Analog Input 1 to the range of Par 800 [Anlg In1 Data]. Par 801 [Anlg In1 Value] is multiplied by this number to produce the input to the lead lag filter function. Par 802 = 1, Par 800 [Anlg In1 Data] = 10 when 10V is applied.	Units: /1v Default: 0.0000 Min/Max: -/+2200000000.0000	✓	RW	Real
803	**Anlg In1 Offset** Applies an offset to Analog Input 1. Use the offset to correct for zero signal errors or to create an offset to the actual input. The output of the A/D converter is summed with this parameter to produce Par 801 [Anlg In1 Value].	Units: Volt Default: 0.0000 Min/Max: -/+20.0000	✓	RW	Real
806	**Anlg In2 Data** Displays the scaled final value for Analog Input 2.	Default: 0.0000 Min/Max: -/+2200000000.0000		RO	Real
807	**Anlg In2 Value** Displays the actual input value at Analog Input 2. Analog Input 2 may be configured for voltage or current input signal. For proper selection of the input signal, the DIP switch and Par 821 [Analog I/O Units] must be set to match. Type of Input: Configurable, Voltage or Current Polarity: Bi-Polar Resolution: 14 bit (-8191 to +8191) AI 2 Voltage: DIP Switch S5-1 = Open; Analog I/O Units Par 821 Bit 1 = 0 (False) AI 2 Current: DIP Switch S5-1 = Closed; Analog I/O Units Par 821 Bit 1 = 1 (True)	Units: V/mA Default: 0V/4 mA Min/Max: -/+20.0000		RO	Real
808	**Anlg In2 Scale** Scales the range of Analog Input 1 to the range of Par 806 [Anlg In2 Data]. Par 807 [Anlg In2 Value] is multiplied by this number to produce the input to the lead lag filter function.	Units: /1v Default: 0.0000 Min/Max: -/+2200000000.0000	✓	RW	Real
825	**Dig In1 Sel** Enter a value to select the function of digital input 1. **Note:** For all Stop Function: Low = Stop, High = ok to Run, In "Norm Stop-CF" Low = Normal Stop and Clear Fault	Default: 0 = "Reserved" Options: 0 = "Reserved" 1 = "Enable" 2 = "Clear Faults" 3 = "Ext Fault" 4 = "Norm Stop-CF" 5 = "Start" 6 = "Reverse" 7 = "Run" 8 = "Reserved" 9 = "Reserved" 10 = "Jog 1" 11 = "Reserved" 12 = "Reserved" 13 = "Jog 2" 14 = "Normal Stop" 15 = "Spd Ref Sel0" 16 = "Spd Ref Sel1" 17 = "Spd Ref Sel2" 18 = "CurLim Stop" 19 = "Coast Stop" 20 = "Accel Decel2" 21 = "Indx Step" 22 = "Indx StepRev" 23 = "MOP Inc" 24 = "MOP Dec" 25 = "MOP Reset" 26 = "PI Trim En" 27 = "PI Trim Hold" 28 = "PI Trim Rst" 29 = "Trend Trig" 30 = "PreCharge En" 31 = "Regis 1 Ltch" 32 = "+Hrd OvrTrvl" 33 = "-Hrd OvrTrvl" 34 = "UserGen Sel0" 35 = "UserGen Sel1" 36 = "UserGen Sel2" 37 = "UserGen Sel3" 38 = "ExtFault Inv" 39 = "Home Switch"			

No.(1)	Name Description (2)	Values (3)			Linkable Read-Write Data Type
826	**Dig In2 Sel** Enter a value to select the function of digital input 2. **Note:** For all Stop Function: Low = Stop, High = ok to Run, In "Norm Stop-CF" Low = Normal Stop and Clear Fault	Default:	0 =	"Reserved"	
		Options:	0 =	"Reserved"	20 = "Accel Decel2"
			1 =	"Enable"	21 = "Indx Step"
			2 =	"Clear Faults"	22 = "Indx StepRev"
			3 =	"Ext Fault"	23 = "MOP Inc"
			4 =	"Norm Stop-CF"	24 = "MOP Dec"
			5 =	"Start"	25 = "MOP Reset"
			6 =	"Reverse"	26 = "PI Trim En"
			7 =	"Run"	27 = "PI Trim Hold"
			8 =	"Reserved"	28 = "PI Trim Rst"
			9 =	"Reserved"	29 = "Trend Trig"
			10 =	"Jog 1"	30 = "PreCharge En"
			11 =	"Reserved"	31 = "Regis 2 Ltch"
			12 =	"Reserved"	32 = "+Hrd OvrTrvl"
			13 =	"Jog 2"	33 = "-Hrd OvrTrvl"
			14 =	"Normal Stop"	34 = "UserGen Sel0"
			15 =	"Spd Ref Sel0"	35 = "UserGen Sel1"
			16 =	"Spd Ref Sel1"	36 = "UserGen Sel2"
			17 =	"Spd Ref Sel2"	37 = "UserGen Sel3"
			18 =	"CurLim Stop"	38 = "ExtFault Inv"
			19 =	"Coast Stop"	39 = "Home Switch"
827	**Dig In3 Sel** Enter a value to select the function of digital input 3.	Default:	0 =	"Reserved"	
828	**Dig In4 Sel** Enter a value to select the function of digital input 4.	Options:	0 =	"Reserved"	20 = "Accel Decel2"
829	**Dig In5 Sel** Enter a value to select the function of digital input 5.		1 =	"Enable"(1)	21 = "Indx Step"
830	**Dig In6 Sel** Enter a value to select the function of digital input 6.		2 =	"Clear Faults"	22 = "Indx StepRev"
			3 =	"Ext Fault"	23 = "MOP Inc"
			4 =	"Norm Stop-CF"	24 = "MOP Dec"
			5 =	"Start"	25 = "MOP Reset"
			6 =	"Reverse"	26 = "PI Trim En"
			7 =	"Run"	27 = "PI Trim Hold"
			8 =	"Reserved"	28 = "PI Trim Rst"
			9 =	"Reserved"	29 = "Trend Trig"
			10 =	"Jog 1"	30 = "PreCharge En"
			11 =	"Reserved"	31 = "Reserved"
			12 =	"Reserved"	32 = "+Hrd OvrTrvl"
			13 =	"Jog 2"	33 = "-Hrd OvrTrvl"
			14 =	"Normal Stop"	34 = "UserGen Sel0"
			15 =	"Spd Ref Sel0"	35 = "UserGen Sel1"
			16 =	"Spd Ref Sel1"	36 = "UserGen Sel2"
			17 =	"Spd Ref Sel2"	37 = "UserGen Sel3"
			18 =	"CurLim Stop"	38 = "ExtFault Inv"
			19 =	"Coast Stop"	39 = "Home Switch"
	Note: If used for HW Enable, digital input 6 is not available. **Note:** For all Stop Function: Low = Stop, High = ok to Run, In "Norm Stop-CF" Low = Normal Stop and Clear Fault				

(1) No. - Parameter Number

- Parameter value cannot be changed until the drive is stopped.

(2) Name - Parameter name as it appears in DriveExecutive software.
Description - Brief description of parameter function.

(3) Values - Define the various operating characteristics of the parameter. There are 3 types of Values: ENUM, Bit and Numeric.

ATEX Approved PowerFlex 700S Phase II Drives in Group II Category (2) Applications with ATEX Approved Motors

General

This section provides information on the operation of an ATEX Approved drive and ATEX approved motor. The motor is located in a defined hazardous environment, while the drive is not. A protective system is required to stop current flow to the motor when an over temperature condition has been sensed in the motor. When sensed, the drive will go into a stop condition. To restart the drive, the over temperature condition must be resolved, followed by a valid start command to the drive. The PowerFlex 700S Phase II drive must have the DriveGuard® Safe-Off with Second Encoder option board installed for ATEX applications. Consult the *DriveGuard® Safe-Off Option for PowerFlex® 700S Phase II AC Drives User Manual*, publication 20D-UM007, for installation instructions if necessary.

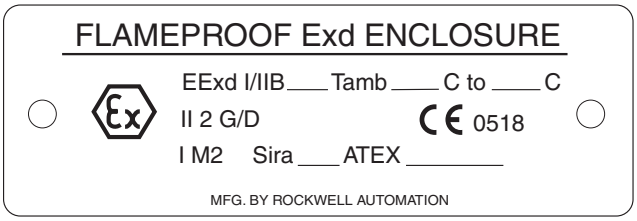
The drive is manufactured under the guidelines of the ATEX directive 94/9/EC. These Drives are in Group II Category (2) Applications with ATEX Approved Motors. Certification of the drive for the ATEX group and category on its nameplate requires installation, operation, and maintenance according to this document and to the requirements found in the User Manual and appropriate Motor Instruction Manual(s).

ATTENTION: Operation of this ATEX certified drive with an ATEX certified motor that is located in a hazardous environment requires additional installation, operation, and maintenance procedures beyond those stated in the standard user manual. Equipment damage and/or personal injury may result if all additional instructions in this document are not observed.

Motor Requirements

- The motor must be manufactured under the guidelines of the ATEX directive 94/9/EC. It must be installed, operated, and maintained per the motor manufacturer supplied instructions.
- Only motors with nameplates marked for use on an inverter power source, and labeled for specific hazardous areas, may be used in hazardous areas on inverter (variable frequency) power.
- When the motor is indicated for ATEX Group II Category 2 for use in gas environments (Category 2G) the motor must be of flameproof construction, EEx d (according to EN50018) or Ex d (according to EN60079-1 or IEC60079-1). Group II motors are marked with a temperature or a temperature code.
- When the motor is indicated for ATEX Group II Category 2 for use in dust environments (Category 2D) the motor must be protected by an enclosure (according to EN50281-1-1 or according to IEC61241-1: Ex tD). Group II motors are marked with a temperature.
- The motor over temperature signal supplied to the drive must be a normally closed contact (open during over temperature condition) compatible with the digital (logic) input circuitry of the drive. If multiple sensors are required in the motor, the connection at the drive must be the resultant of all required contacts wired in series.

- Refer to all product markings for additional cautions that may apply.
- Typical motor markings are contained on a motor certification nameplate similar to the sample below.

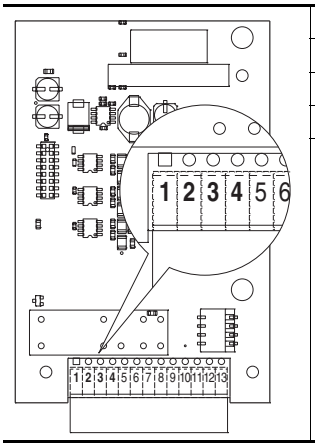


Drive Wiring

Important: ATEX certification of this drive requires that two separate inputs be configured to monitor a normally closed, over temperature contact (or multiple contacts wired in series) presented to the drive from the motor.

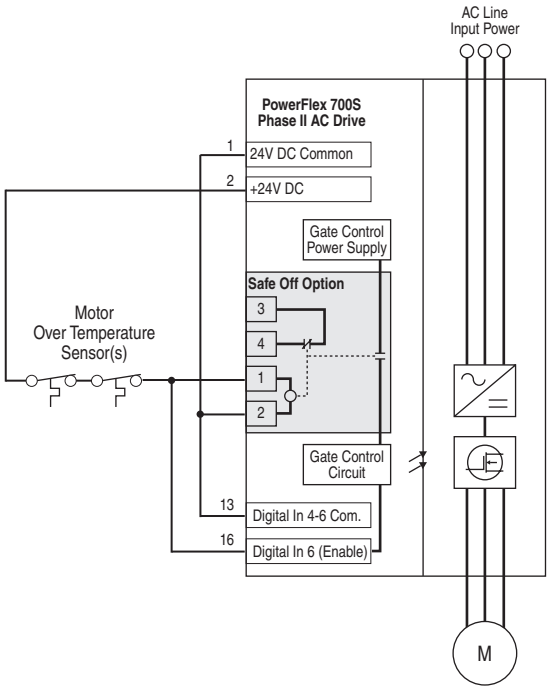
The first input must energize “Digital Input 6/Hardware Enable” on the drive control board (TB2, terminal 16). The second input must energize the relay coil on the DriveGuard® Safe-Off with Second Encoder option board (terminals 1 & 2 on the board). This option board must be installed in the drive for ATEX applications. It is offered with a 24V DC coil only. Both input signals are wired with respect to the drive's digital input common when using a control board with 24V I/O. Refer to the drive User Manual regarding setup for either internal or external 24V logic power. Motor supplied contacts must have ratings compatible with the input circuit ratings and applied voltage level of the drive.

Safe-Off Terminal Descriptions



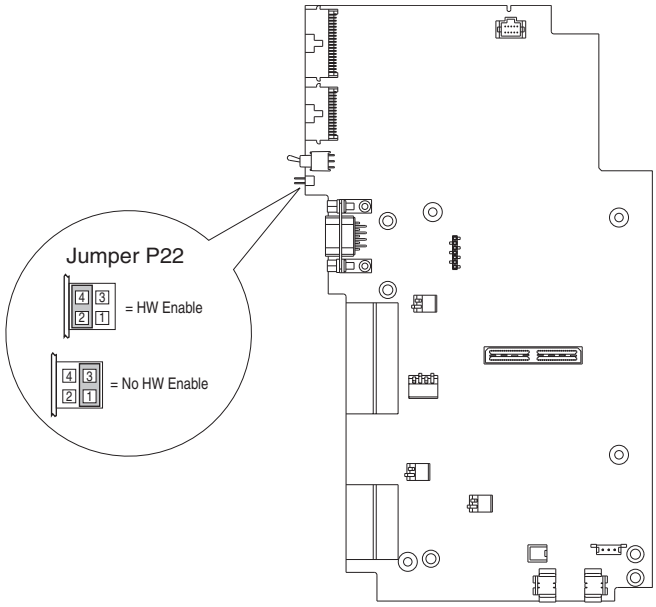
No.	Signal	Description
1	+24V DC	Connections for power to energize coil. 33.3 mA typical, 55 mA maximum.
2	24V Common	
3	Monitor - N.C.	Normally closed contacts for monitoring relay status. Maximum Resistive Load: 250V AC / 30V DC / 50 VA / 60 Watts Maximum Inductive Load: 250V AC / 30V DC / 25 VA / 30 Watts
4	Common - N.C.	

Wiring Example



Drive Hardware Configuration

Digital Input 6 must be configured as a Hardware Enable. Ensure that Jumper P22 on the Main Control Board is set to HW Enable (Pins 2 and 4).



Verify Operation

At regular intervals during the life of the machine check the protective system for proper operation. Both channels shall be verified using the table below. How frequently the protective system is checked is dependent on the safety analysis of the machine section controlled by the drive.

Protective System Status	Drive In Safe State	Drive In Safe State	Drive In Safe State	Drive Able To Run
Channel Operation				
Safe-Off Option Terminals 1 & 2	No Power Applied	Power Applied	No Power Applied	Power Applied
PowerFlex 700S Phase II Enable Input	No Power Applied	No Power Applied	Power Applied	Power Applied
Description For Verification				
Safe-Off Option Monitor Contact Terminals 3 & 4	Closed	Open	Closed	Open
PowerFlex 700S Phase II Drive Inhibits Param. 156, Bits 1 & 16	Bit 16 = 1 Bit 1 = 1	Bit 16 = 0 Bit 1 = 1	Bit 16 = 1 Bit 1 = 0	Bit 16 = 0 Bit 1 = 0

1. Tag naming:
   - **a)** Use a convention when naming tags and consistently follow the convention set.
   - **b)** Add descriptions for each tag when creating the tag.
   - **c)** Example convention (used at Allen-Bradley):
     - **i.** `<prefix>_<function>_<suffix>`
     - **ii**. `prefix` - use to identify the machine section in multi-section programs.
       1) Sct1 = Section 1, or Fan2 = Fan 2, or RewA = Rewind A
     - **iii**. `function` - use to describe the function or signal of the tag.
     - **iv**. `suffix` - use to identify the units of the signal or control status.
       1) Rpm = Rotations per Minute, or Ok = status OK, or Off = contact Off
     - **v**. Example: Sct2_SpdRef_Fpm, Fan5_FaultState_OK

2. Use Aliasing for all Static Assembly connections with DriveLogix and the PowerFlex 700S
   - **a)** Improves program portability over processors and through upgrades to DriveLogix, PowerFlex 700S, and RSLogix 5000 firmware.
   - **b)** Allows real names to be applied to the User Defined tags of the static assembly.
   - **c)** Allows new functions of DriveLogix and the PowerFlex 700S to be clearly named in the program even if RSLogix 5000 has not been updated.
   - **d)** Allows long tag names in RSLogix 5000 to be shortened for easier program viewing.
   - **e)** Allows tags to be named using the above naming convention to identify machine section association.
   - **f)** Apply aliases to all external connections including the PowerFlex 700S static assembly and I/O. All defined bits should be included.

3. Use "Periodic Tasks" to optimize processor utilization.
   - **a)** Name periodic tasks to identify the update time.
     - **i**. Ex. Periodic_020ms_P9 = 20ms task with priority 9
   - **b)** Set the periodic task time appropriate programming requirements. **Note**: the faster the task time (function execution) the more processor bandwidth used.
   - **c)** Set the priority of each task to coincide with the task speed. Set faster tasks to higher priority (lower number = higher priority, i.e, 9 is a higher priority than 10)
   - **d)** Do not set the priority number lower than 8 (recommended priority range is 8-15). This will provide I/O scanning with optimal updating. Compact I/O is coded as priority 7 for DriveLogix.

Troubleshooting

Abbreviated Fault & Alarm Clearing

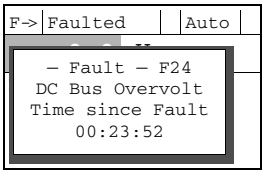
For a complete listing of Faults and Alarms, refer to the *PowerFlex 700S Drives with Phase II Control User Manual*, publication 20D-UM006.

A fault is a condition that stops the drive. There are two fault types.

Type	Fault Description	
①	Non-Resettable	This type of fault normally requires drive or motor repair. The cause of the fault must be corrected before the fault can be cleared. The fault will be reset on power up after repair.
②	User Configurable	Programming and commissioning personnel can configure the drive's response to these exception events. Responses include: • Ignore • Alarm • Fault Coast Stop • Fault Ramp Stop • Fault Current Limit Stop

HIM Indication

The HIM also provides visual notification of a fault or alarm condition.

Condition	Display
Drive is indicating a fault. The LCD HIM immediately reports the fault condition by displaying the following: • "Faulted" appears in the status line • Fault number • Fault name • Time that has passed since fault occurred Press **Esc** to regain HIM control.	

Manually Clearing Faults

This section illustrates a table showing the HIM keystrokes necessary to clear faults.

Step	Key(s)
1. Press **Esc** to acknowledge the fault. The fault information will be removed so that you can use the HIM.	
2. Address the condition that caused the fault. The cause must be corrected before the fault can be cleared.	
3. After corrective action has been taken, clear the fault by one of these methods. • Press **Stop** • Cycle drive power (wait five (5) minutes before re-applying power to the drive) • Select **Clear Faults** from "Diagnostic - Faults" menu	

Technical Support

Online

You can access the complete *PowerFlex® 700S Drives with Phase II Control User Manual*, publication 20D-UM006, online at:

http://www.rockwellautomation.com/literature

PowerFlex 700S and DriveLogix™ Technical Support is available online.

Important: You are encouraged to navigate our **free** website as part of your installation and start-up process.

To access the Technical Support website:

1. Open your Internet Browser, this may be: Microsoft® Internet Explorer, Netscape®, or Opera®.
2. With your browser open, type in the following URL address in your path bar.

   http://www.ab.com/support/abdrives/powerflex700s/phase2/index.html

3. Press the **Enter** key or click the **Go** button. This will take you to our website.

Drives Technical Forum

Remember that we currently offer a *Drives Technical Forum* for all Allen-Bradley® drive products. The forum can also help you solve issues in areas such as *Application*s, *Communication*s, *Hardware* and *Software*. You can visit us at the following URL address...

http://www.ab.com/support/abdrives/registered.html

Telephone

Drives Technical Support Hotline :

Monday through Friday, 7:00a.m. to 6:00p.m. Central time
Call **1-262-512-8176**

Notes:

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